GE Medical Systems

DRS3.2 with Advantx Console

CE 0459

Operator Manual

2236982–100

Revision 3

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Operator Manual

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WARNING

X–RAY EQUIPMENT IS DANGEROUS TO BOTH PATIENT AND OPERATOR UNLESS MEASURES OF PROTECTION ARE STRICTLY OBSERVED

Though this equipment is built to the highest standards of electrical and mechanical safety, the useful x–ray beam becomes a source of danger in the hands of the unauthorized or unqualified operator. Excessive exposure to x–radiation causes damage to human tissue.

Therefore, adequate precautions must be taken to prevent unauthorized or unqualified persons from operating this equipment or exposing themselves or others to its radiation.

Before operation, persons qualified and authorized to operate this equipment should be familiar with the Recommendations of the International Commission on Radiological Protection, contained in Annals Number 60 of the ICRP, and with applicable national standards.

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SERVICES OFFICES

For service issues, contact the Service office in your country.

AMERICAS

UNITED STATES OF AMERICA
GE Medical Systems Headquarters
3000 North Grandview Blvd.
WAUKESHA, WI 53188
Mail:P.O. Box 414
MILWAUKEE, WI 53201
Tel: +1–414–544–3011

LATIN AMERICA
GE Medical Systems
Latin America Headquarters
5101 NW 21st Avenue, Suite 350
FORT LAUDERDALE, FL 33309
USA
Tel: +1–305–497–1200

ASIA

NIPPON *(Japan)*
GEMSA Headquarters
GE Medical Systems Asia
67–4, Takakura, Hachioji
TOKYO, 192–0033, JAPAN
Tel: 81–426–48–2940
Fax: 81–426–48–2905

REST OF ASIA
GE Pacific Pte. Ltd (GEMS Asia)
South East Asia Pacific Operations (SEAPO)
298 Tiong Bahru Road
#15–01/06 Tiong Bahru Plaza
SINGAPORE 0316
Tel: +65–291–8528
Fax: +65–291–7006

EUROPE

BELGIE/BELGIQUE *(Belgium)*
GE Medical Systems Benelux NV/SA
Manhattan Center
Bolwerklaan 21 b9 Avenue du Boulevard
B–1210 BRUSSEL/BRUXELLES
(NL) Tel:+32 2 644 09 38
(F) Tel:+32 2 644 08 42
(LUX) Tel:0800 2973
Fax: +32 2 207 73 33

DANMARK *(Denmark)*
GE Medical Systems Danmark
Skovlytoften 4
DK–2840 HOLTE
Tel: +45 45 51 00 55
Fax: +45 42 42 59 89

DEUTSCHLAND *(Germany)*
GE Medical Systems Deutschland
GmbH & Co. KG
Martin–Behaim–Strasse 10
D–63263 NEU_ISENBURGS
Tel: 49–6102–36–0
Fax: +49 610–36–2588

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ESPAÑA *(Spain)*
GE Medical Systems España
Avda. de Europa 22
Parque Empresarial la Moraleja
E–28100 ALCOBENDAS
Tel: +34 1 663 25 00
Fax: +34 1 663 25 01

FRANCE *(France)*
GE Medical Systems
283 rue de la Minière
BP34
F–78533 BUC CEDEX
Tel: +33 (0)1 30 70 40 40

HELLAS *(Greece)*
GE Medical Systems Hellas
41 Nikolaou Plastira Street
GR–171 21 NEA SMYRNI
Tel: +30 1 93 24 582
Fax: +30 1 93 58 414

ITALIA *(Italy)*
GE Medical Systems Italia
Viale Fulvio Testi 28–B
20126 MILANO
Tel: +39 02 64 22 01
Fax: +39 02 64 22 0401

NEDERLAND *(Netherlands)*
GE Medical Systems Nederland B.V.
Hambakenwetering 1
NL–5231 DD S HERTOGENBOSCH
Tel: +31 73 6 457 457
Fax: +31 73 6 441 233

ÖSTERREICH *(Austria)*
GE GesmbH Medical Systems Austria
Prinz Eugen Strasse 8/8
A–1140 WIEN
Tel: 0660 8651 (gebührenfrei)
Fax: +43 1 505 38 74
Tlx: 136314

POLSKA *(Poland)*
GE Medical Systems Polska
Krzywickiego 34
P–02–078 WARSZAWA
Tel: +48 2 625 59 62
Fax: +48 2 615 59 66

PORTUGAL *(Portugal)*
GE Medical Systems Portuguesa S.A.
Rua Sà da Bandeira, 585
Apartado 4094
P–4002 PORTO CODEX
Tel: +351 2 2007696/97
Fax: +351 2 2084494
Tlx: 22804

ROSSIYA *(Russia)*
GE Medical Systems
Kosmodamianskaya nab. 52, Bldg 1, 6th Floor
113054 MOSCOW
Tel:+7 095 935 72 41
Fax:+7 095 935 73 46 and 48
Tel (satellite): +7 502 220 30 39
Fax (satellite): +7 502 220 32 59
Tlx:613020 GEMED SU

SVERIGE *(Sweden)*
GE Medical Systems
Box 6768
St. Eriksgatan 117
S–113 85 STOCKHOLM
Tel: +46 8 457 95 20
Fax: +46 8 457 95 47
Tlx: 12228 CGRSWES

SCHWEIZ/SUISSE *(Switzerland)*
GE Medical Systems (Schweiz) AG
Sternmattweg 1
CH–6010 KRIENS
Tel: 155 6958 (gebührenfrei)
Fax: +41 41 421859

TÜRKIYE *(Turkey)*
GE Medical Systems Turkiye A.S.
Mevluk Pehliran Sodak
Yilmaz Han, No 24 Kat 1
Gayretteppe
ISTANBUL
Tel: +90 212 75 5552
Fax: +90 212 211 2571

UNITED KINGDOM
IGE Medical Systems
Coolidge House
352 Buckingham Avenue
SLOUGH
Berkshire SL1 4ER
Tel: +44 753 874000
Fax: +44 753 696067

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INTRODUCTION

1. DEFINITION OF WARNINGS, CAUTIONS, AND NOTES

AN OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION, ETC., WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN SERIOUS INJURY.

An operating or maintenance procedure practice, condition, etc., which if not strictly observed, could result in damage to, destruction of, or loss of effectiveness of equipment.

Note: **An essential operating, installation, or maintenance procedure, practice, condition, etc., which must be brought to the attention of the reader.**

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2. REGULATORY REQUIREMENTS

This product complies with the regulatory requirements of the following:

- ❑ Council Directive 93/42/EEC concerning medical devices when it bears the following CE marking of conformity. CE 0459

For a system, the location of the CE marking label is described in the system manual.

European registered place of business:

GE Medical Systems Europe
Quality Assurance Manager
BP 34
F 78533 BUC CEDEX France – Tel: +33 (0)1 30 70 40 40

– For additions to an existing installation, the CE marking label is located on the upper part of the DRS cabinet.

- ❑ Green QSD 1990 Standard issued by MDD (Medical Devices Directorate, Department of Health, UK).
- ❑ Medical Device Good Manufacturing Practice Manual issued by the FDA (Food and Drug Administration, Department of Health, USA).
- ❑ Underwriters' Laboratories, Inc. (UL), an independent testing laboratory. (UL 478 and UL 1950)
- ❑ Canadian Standards Association (CSA).
- ❑ International Electrotechnical Commission (IEC 601–1–1), international standards organization, when applicable.
- ❑ USA/HHS:

United States Federal law restricts this device to use by or on the order of a physician.

- ❑ *General Electric Medical Systems* is ISO 9001 certified.

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Note: This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with emission limits for Group 1 Class A Medical Devices as stated in EN 60601–1–2.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment is found to cause interference (which may be determined by switching the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem using one or more of the following measures:

- ❑ Reorientate or relocate the affected device(s).
- ❑ Increase the distance separating the affected device from the equipment.
- ❑ Power the equipment from a source different from that of the affected device.
- ❑ Consult the point of purchase or the service representative for further suggestions.

The manufacturer is not responsible for any interference caused either by the use of interconnect cables other than those recommended or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

To comply with the regulations applicable to an electromagnetic interface for a Group 1 Class A Medical Device, all interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference in violation of the European Union Medical Device directive and FCC regulations.

- ❑ The original document was written in English.

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RECYCLING:

Machines or accessories at end–of–life:

The elimination of machines and accessories must be in accordance with national regulations for waste processing.

All materials and components that could pose a risk to the environment must be removed from the end–of–life machines and accessories (examples: dry and wet cell batteries, transformer oil, etc...).

Please consult your local GEMS representative before discarding these products.

Packing materials:

The materials used to pack our equipment are recyclable. They must be collected and processed in accordance with the regulations in force for the country where the machines or accessories are unpacked.

IMAGE ANNOTATIONS

Note: Since the equipment allows the physician to store information on the patient with the function IMAGE ANNOTATIONS, the European Directive regarding "the protection of the people with regard of data management on their private life and to the free circulation of these data" requests to the computerized file users (radiologists, physicians) not to store data related to their:

- **race,**
- **philosophical opinions,**
- **religious opinions,**
- **political opinions,**
- **etc.**

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1 – PRESENTATION

1–1 SYSTEM DESCRIPTION

Your DRS Digital Radiology System combines the functions of a Digital image converter, and of an image processor, which performs all necessary image enhancements before clinical diagnoses are conducted.

It is a powerful, easy–to–use, and reliable device, and open to connectivity.

You can also optionally archive digital studies on 8–mm magnetic tape, transfer studies digitally to workstations and/or get remote patient data via the Ethernet network, Dicom 3.

1–2 COMPOSITION

This operator manual may mention options which are not present in your system.

The composition of your system depends on the options which have been ordered.

You should refer to your customer order to understand exactly the composition and the performances of your DRS system.

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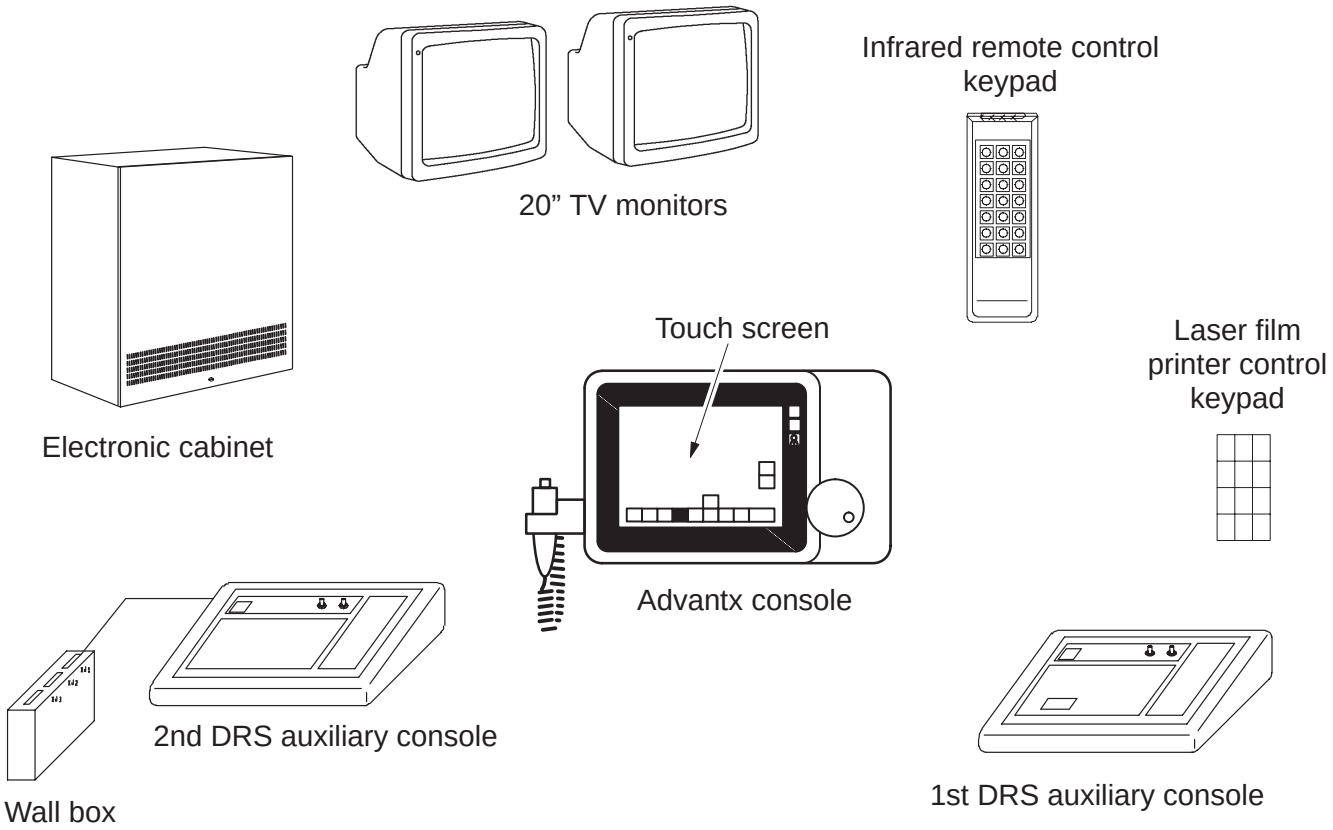
Illustration 1 – Maximum configuration



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1–3 USER INTERFACES

1–3–1 Touch screen acquisition

Please, refer to the Operator Manual of your Advantx System.

1–3–2 DRS auxiliary consoles

1–3–2–1 Introduction

For diagnostic only purposes, it is possible to purchase a second DRS auxiliary console and to locate it farther away from the first auxiliary console.

This second console is not an independent console – a command made on one console will also impact the second console. to avoid contradictory commands, please make sure that both consoles are never used simultaneously.

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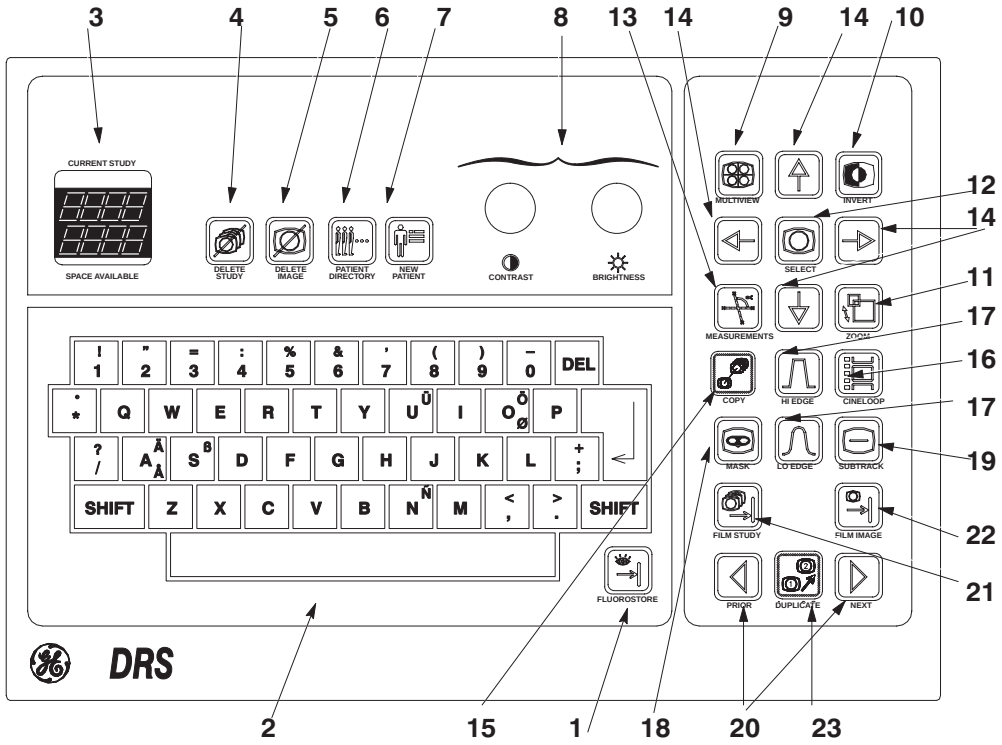
1–3–2–2 Control keyboard

Illustration 2 – DRS auxiliary console – control keyboard



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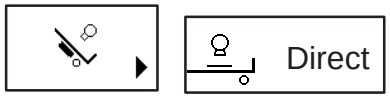
1–3–2–3 Description of the controls

Screen Saver

There is no screen saver for the TV monitor at the DRS control console. This will eventually result in the DRS Patient Entry screen outline being burnt onto the monitor. To reduce the chance of this happening, you may blank the TV monitor screen by performing the following:

On an Advantx system, select “Conventional Fluoro” and then select “Tube Warm Up”.

On a Prestige system, select “Image Receptor” and then select “Direct (table top)”.

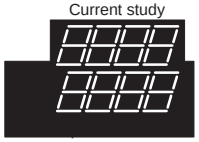


On a system with an MPG generator, select “Station 1”.

On a system with a Phasix generator, select “Table Top”.

1 **[FLUOROSTORE]** stores the live fluoro image, or the LIH, to disk. A beep is emitted when storing is completed (refer to para. 2–5–1 of Chapter 2).

2 The alphanumeric keyboard is mainly used to enter Patient data, or image annotations. The **[SHIFT]** and **[?]** keys allow Dictionary recall, depending on system selection (refer to para. 2–7–3 of Chapter 2). The **[SHIFT]** and keys allow quick entry of texts from Dictionary.



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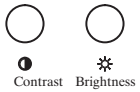
3 **Current Study**: Displays the number of images (maximum 200) in the current study, increments at each acquisition, and decrements at each image deletion. The left display segment also warns of degraded modes.
Space Available: Displays the number of images still available on disk (or tape), and flashes when the value is less than 26 images.

4 **[DELETE STUDY]** erases all images of a study from disk, if pressed twice while the Patient Directory is displayed. A beep is emitted when the action is completed. Each study can be protected against deletions (refer to para. 2–9–3 of Chapter 2).

5 **[DELETE IMAGE]** erases an image, if pressed twice while the image is displayed. A beep is emitted when the action is completed (refer to para. 2–7–5 of Chapter 2).

6 **[PATIENT DIRECTORY]** displays the list of patients on disk, allows study retrieval, study transfer to network and/or tape, study protection against deletions, and access to the configuration menu. The key lights up when the screen is displayed (refer to para. 2–9–1 of Chapter 2).

7 **[NEW PATIENT]** displays a menu that allows patient data input, then exits the menu. The key lights up when the menu is displayed (refer to para. 2–2 of Chapter 2).



8 The **[CONTRAST] / [BRIGHTNESS]** rotary knobs (on the console) or keys (on the remote keypad) adjust the Window/level of the image (refer to para. 2–6–1 of Chapter 2).

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9 Pressing **[MULTIVIEW]** once displays 15 successive images on a single screen. Pressing **[MULTIVIEW]** a second time displays four successive images on a single screen. Pressing a third time returns to the standard 1–in–1 display mode. The key lights up when the function is active (refer to para. 2–8–1 of Chapter 2).

10 **[INVERT]** reverses the contrast (black for white) of the image that is displayed, or of the next image that will be acquired. The key lights up when the contrast is reversed with respect to the default value set in the user configuration menu
(refer to para. 2–6–2 of Chapter 2).

11 Pressing **[ZOOM]** once displays a Region Of Interest on the 1–in–1 image. Pressing **[ZOOM]** a second time magnifies the ROI by two. Pressing a third time returns to the standard 1–in–1 display mode. The key lights up when the function is active
(refer to para. 2–6–8 of Chapter 2).

12 **[SELECT**] is used to individually tag images to be transferred to network, or to the film printer when using Film Study. A Select icon marks out the selected images. The key lights up when the image is selected. **[SELECT]** is also used to select or modify a parameter in the User Configuration Menu or in the Printer Menu
(refer to para. 2–8–2–2 of Chapter 2).

13 Pressing **[MEASUREMENTS]** (option) once displays angles, that can be moved and modified, using the Return key and the four Arrows. Pressing **[MEASUREMENTS]** a second time displays segments, that can be moved and modified, using the Return key and the four Arrows. Pressing a third time deletes the measurement displays. The key lights up when the function is active (refer to para. 2–7–1 of Chapter 2).

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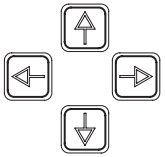

14 The four arrows are used, with the following priorities, to carry out the following operations:

1/ Move the ROI

if key is On and the image is not magnified.

2/ Move the angles and segments

if key is On and no ROI is displayed.

3/ Apply Pixel Shift of the Mask

if a mask has been selected, is On, is Off, and no ROI is displayed.

This case becomes first priority after Record subtracted acquisition (Pixel Shift).

4/ Roam the Region of Interest (”Zoom” mode)

if is On, the image is magnified, and and are Off.

5/ Select an Image in a collage

if is On, and are Off.

6/ Manually adjust the digital shutters

if , , , and are Off.

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The arrows are also used to:

– Select commands and parameters in the various menus and screens.

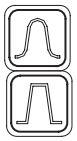
– Select Automatic Mode (option) for the digital shutters.

– Invert the image horizontally (left and right arrow pressed simultaneously) or vertically (up and down arrow).

– Move in the Dictionary.

15 **[COPY]** (option) propagates some attributes of the current image (Annotations, Window/Level, Edge–Enhancement filters, Shutters) to the next image. The key lights up when the function is active (refer to para. 2–7–4 of Chapter 2).

16 **[CINE LOOP]** displays in loop all the images of a Record sequence, at their acquisition rate. The key lights up when the function is active
(refer to para. 2–6–9 of Chapter 2).



17 **[HI EDGE]** and **[LO EDGE]** adjust the edge–enhancement filters applied to the image. During fluoroscopy acquisition (option), **[HI EDGE]** and **[LO EDGE]** are used to increase or decrease Fluoro Noise Reduction (FNR) filters. Pressing both keys simultaneously resets the Edge–Enhancement or the FNR filter to the default value set in the User Configuration menu (refer to para. 3–1 of Chapter 3).

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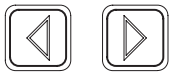
18 **[MASK]** (option) is used to:

- Prepare the system to run Peak–Opacification fluoroscopy,
- Select a mask for post–processing subtractions,
- Select a mask for single–shot real–time Record subtractions,
- Select a mask for real–time fluoroscopy subtractions (refer to para. 3–4–2–2 of Chapter 3).

19 **[SUBTRACTION**] (option) allows to subtract images in real–time (fluoroscopy or Record Mode), or in post–processing (Record Mode).

The keys light up when the functions are active (refer to para. 3–4 of Chapter 3).



20 **[PRIOR]** and **[NEXT]** display the previous or next image of the study. These keys also decrease or increase the display speed of Cine loops, and change pages in the Patient Directory, in the User Configuration Menu and in the Multiview.

21 Pressing **[FILM STUDY]** (option) once displays a screen that allows modification of print parameters. Pressing a second time starts the background filming of all selected images in the current study. The key flashes during the transfer (up to several minutes for large studies). This function is not active when using the printer keyboard (refer to para. 2–8–2–3 of Chapter 2).

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22 Pressing **[FILM IMAGE]** (option) once displays a screen that allows modification of print parameters. Pressing a second time starts filming of the current image. The key flashes during transfer (a few seconds). This function is not active when using the printer keyboard (refer to para. 2–8–2–1 of Chapter 2).

23 **[DUPLICATE]** (option) transfers the current image to the optional second monitor. The key lights up when the function is active (refer to para. 3–6 of Chapter 3).

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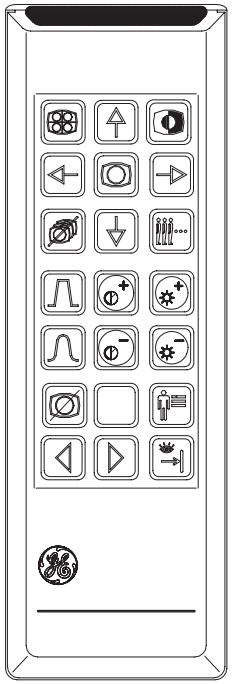
1–3–3 The infrared remote control keypad

Illustration 3 – The infrared remote control keypad



- Multiview (15–1), (4–1)
- Contrast Inversion
- Image selection
  For a basic system, this key is used to protect/unprotect a patient study
- Study delete
- Patient Directory
- Hi–Edge and Lo–Edge Enhancement filters
- Windowing (Contrast/Brightness)
- Delete current image
- New patient
- Prior Image
- Next Image
- Fluorostore

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2 – OPERATION

This chapter describes the Image processor operation. For information on X–ray generation or Room control, refer to the System Operator Manuals.

2–1 START UP

2–1–1 Power on / Power off

Via the I/O button of the Integrated Console

2–1–2 Lighting–on of all displays

CAUTION

When switching on the DRS, verify that all corresponding displays on the console are active.

2–1–3 Space available on disk

CAUTION

DISK FULL: the digital display flashes.

No image space available for an acquisition.

- **The system does not allow new patient files to be created.**
- **The system does not allow Digital Mode to be used (spotfilm device cassette available).**
- **Fluoroscopy remains active.**

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2–1–4 Create a patient directory in case of a study using the “Spot Film Device” Image receptor

When starting up, the selected Image Receptor may be the “Spot Film Device”.
However, to enable X–ray exposures (Fluoroscopic or Radiographic), it is necessary to create a patient directory, even if you do not want to use DRS.

a. Select DRS Image Receptor.

b. Press “New patient” key.

c. Enter a patient name only if you want to also use the DRS for this patient.

d. Press the “New patient” key again.

e. Re–select “Spot Film Device” Image receptor.

2–1–5 DRS Image receptor selection

Select DRS image receptor on Advantx console.

Following messages are then displayed:

AUTOTEST version X.XX XXXXXX
AUTOTEST OK

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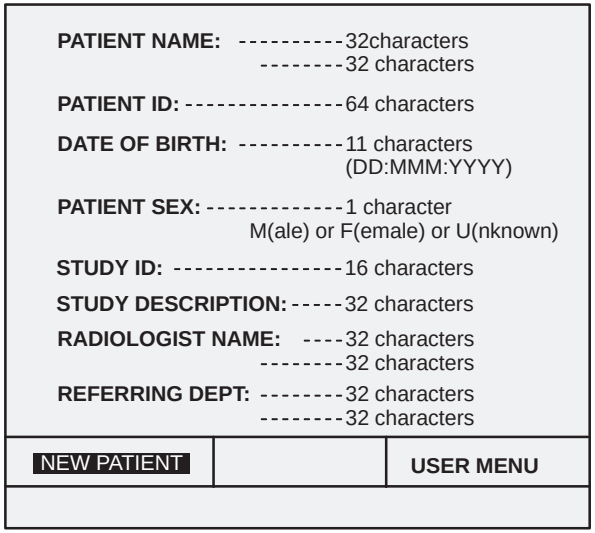
2–2 NEW STUDY

Illustration 4 – New patient screen



2–2–1 Definition

For DRS, a study is a set of images stored under the same Patient Name.

2–2–2 Enter the New Study screen

Enter the New Study screen, by pressing , key.

Type in the Patient Name, the Radiologist Name, and Patient Identifier if needed.

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2–2–3 Typing

Press the key of the keyboard to go from one line to another.

Type text using the alphanumeric keyboard.

Special characters:

Characters	Ü	Ö	Ø	ß	Å	Ä	Ñ
Press	Shift +U	Shift +O	Shift +esp + O	Shift +S	Shift +esp + A	Shift + A	Shift + N

Already made complete expressions can be obtained from a specific dictionary (refer to 2–7–3, page 63).

2–2–4 Exit from “New Patient” screen

Press “New Patient” again on the screen to validate the typed data.

Once the study is created, DRS is ready for image acquisition, and displays the screen shown in Illustration 5.

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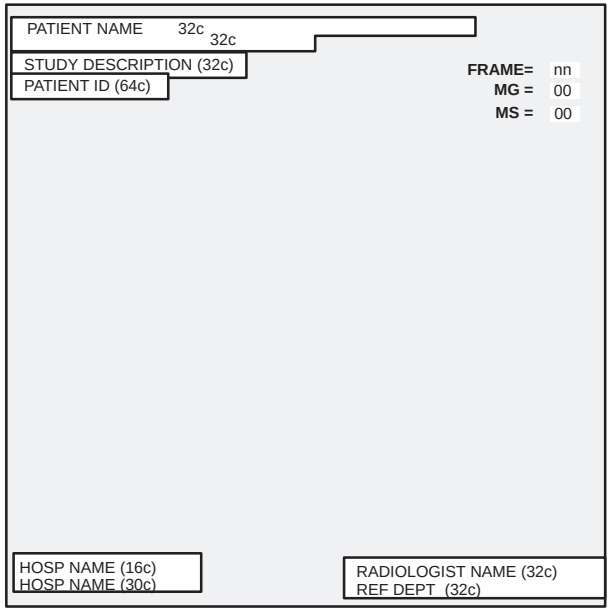
2–3 DRS PRE–ACQUISITION SCREEN

Illustration 5 – DRS pre–acquisition screen



The Patient name, Patient Id, and Study Description are those entered in the New Patient screen. Patient's name is limited to a 19 characters lign, and the "study description" area stays empty. It will be possible to update these data utilizing the DRS console keyboard, when reviewing the study.

The Hospital name is set in the User Configuration menu (refer to para. 3–1 of Chapter 3).

The Radiologist Name and Referring Department displayed here are the first line of those entered in the New Patient screen. Radiologist's name is limited to a 19 characters lign, and the "prescribing Department" area stays empty if the study has been created from the Advantx console. It will be possible to update these data utilizing the DRS console keyboard, when reviewing the study.

RADIOGRAPHY PARAMETERS

Adjust X–ray parameters (kV, mA, ms), or, if APR is available, select an anatomical program.

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2–4 FLUOROSCOPY

If DRS is in a state where acquisitions are possible, and if Image Hold Fluoro is selected on the Advantx console, any fluoroscopic image will be digitized and can be stored on DRS.

The DRS Image screen during Digital Fluoro is similar to the Acquisition screen, with the exception that the Frame number displayed is **FRAME=XX.**

2–4–1 Fluoro Noise Reduction (FNR)

In order to reduce X–ray quantum noise on fluoro images, Digital Fluoroscopy is filtered by DRS.

Check FNR is declared ON in the User Menu.

The FNR filter is applied to all fluoro images, and is based on a sophisticated averaging of the successive digital frames. Consequently, random noise, which varies rapidly from one frame to the next one, is greatly reduced.

Because the fluoro image “remembers” the previous frames, filtered images may sometimes give a sensation of lag. Because this effect needs to be reduced when objects in the image move quickly, DRS offers a range of 13 filters, that can be selected in real time while fluoro is activated:

The first fluoro image in a new study will use the default filter, defined in the User Configuration menu.

While Fluoro is activated, press on touch screen or remote keypad, to reduce the FNR strength.

The image display will show the value in the bottom right of the image:

FNR = 0 will de–activate all FNR.

FNR= 13 will reduce to a minimum X–ray quantum noise, but will maximize the sensation of lag.

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Pressing will increase FNR strength.

Each time Fluoro is released, the last FNR value is memorized, so that subsequent runs will start with this value.

For Advantx systems, FNR can be modified from Advantx Console.

2–4–2 Edge filter on fluoro images

Fluoro images also undergo real–time edge filtering. This filter is defined in the user Configuration menu, and cannot be adjusted in real time.

2–4–3 Last Image Hold (LIH)

Digital Fluoroscopy has the advantage that the last fluoro frame acquired remains frozen on the video monitor when Fluoro is released. To differentiate the LIH from live fluoro, the DRS image screen of the LIH has FRAME= 00

The LIH can be windowed, annotated, shuttered, zoomed, and filmed (Film Image only).

It will be erased and lost if or is pressed, or if a new acquisition is started.

It can also be stored on disk by pressing [FLUOROSTORE].

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2–4–4 Fluorostore

DRS allows disk archiving of any Fluoro image.

Press the key on the DRS console or remote keypad, while Fluoro is active or while the LIH is displayed.

The image will be stored on disk as it is displayed on screen, including if it is subtracted, or Peak–Opacified. To differentiate Fluorostores from Record images, a Fluoro icon (**F**) is displayed under the Frame number, on the top right of the image.

Fluorostores can be selected as masks for subsequent Fluoro subtractions (refer to para. 3–4 of Chapter 3), and can be study–filmed.

2–5 IMAGE RECORDING

If the DRS is in a state where acquisitions can be made, and if the Digital Record technique is selected, then Record images will be digitized and stored on DRS.

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Illustration 6 – DRS acquisition screen

2

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The various acquisition modes are as follows:

2–5–1 Digital fluoroscopy

Press the fluoro footswitch:

IMAGE XX appears on the screen.

The II field is displayed : N for Normal
M1, M2 or M3 : magnification function selected (zoom)
(according to the Image Intensifier size)

While the fluoro footswitch is pressed, FNR (Filter Noise Reduction) is displayed at the bottom of the screen (the FNR is set in the User Menu) (Illustration 7–a). The or key can be used (option) to adjust the FNR between 0 and 13 (see Illustration 7–b).

Press to record the fluoroscopic image displayed (real–time or LIH). **F** is displayed at the top of the screen to indicate that the image is stored (see Illustration 7–c).

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Illustration 7–a
FNR Display

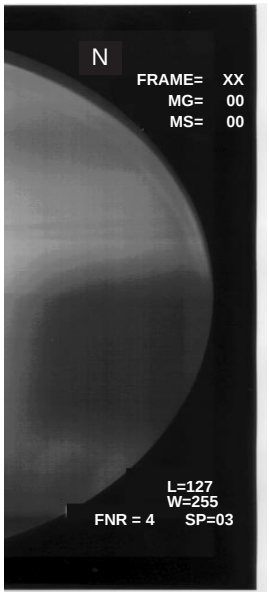

Illustration 7–b
FNR Adjustment

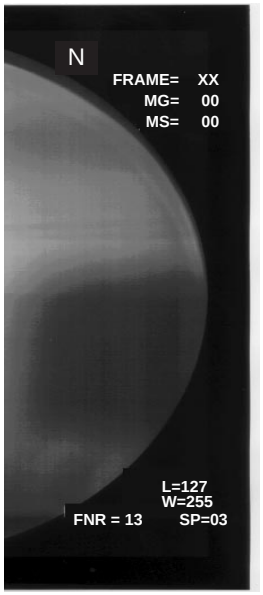

Illustration 7–c
F Display

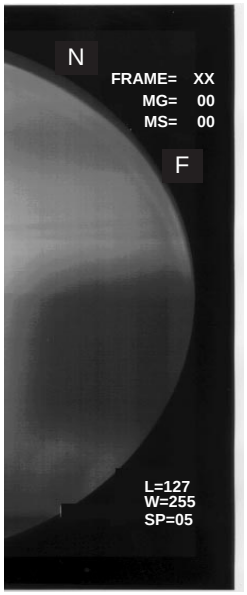

Illustration 7–d
Sequence speed scale

2

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2–5–2 Digitized Radiography

Press the Prep and Exposure buttons to generate X–radiation.
At each exposure, a ⌋ is displayed on the right of the image monitor (Illustration 7–d).

– For the Advantx Systems, record acquisition rate is selected on the Advantx console. It can be single–shot, or any rate 1, 2, 3, 4, 5 and 6 frame/sec.

Never shutdown the system as long as the speed scale is displayed
(see para. 2–10 Removing Power from the System).

The images are automatically transferred to disk during the acquisition at more than 2 i/s.

Maximum study capacity is 200 images by patient.

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2–6 ENHANCING THE IMAGE

2–6–1 Window/Level

If needed, the overall brightness and contrast of the image can be modified, using the Window/Level knobs (on DRS console) or keys (on remote keypad). Although this feature allows image presentation to be refined, it cannot replace a correct setting of the radiological parameters, especially kV and mA, that provide the intrinsic brightness and contrast of the image.

The Level is the digital value that will correspond to a medium gray on the video monitor. The Level value is displayed on the screen, and varies from 0 to 255. Turning the Brightness knob clockwise, or pressing **[BRIGHTNESS +]** on the keypad will increase the brightness by decreasing the Level.

The Window is the range of digital values that will be displayed on screen. The width of the Window is displayed on screen, and varies from 4 to 999. Turning the Contrast knob clockwise, or pressing **[CONTRAST +]** on the keypad will increase the contrast by decreasing the Window width.

The standard Level value is 127 and the standard Window value is 255. When an image is recorded, it is automatically displayed with these standard values. The User Configuration menu allows another set of default values to be selected for Window and Level. This set of values is applied as soon as one of the knobs (or keys) is touched.

In Subtraction Mode, the reference value for the Level is N = 085, and the reference value for the Window is L = 170.

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2–6–2 Invert (grey scale)

Conventional Fluoro image display is such that bones, barium, or opacified structures are darker than air or soft tissues. On the contrary, radiographic images are such that bones, barium, or opacified structures are whiter than air or soft tissue.

Digital image processing allows any image to be presented either way, by inverting the contrast.

When an image is displayed, press to reverse the contrast. Further exposures (Record or Fluoro) will be reversed, until the is turned Off.

On DRS, Black barium is called Normal, and White barium is called Reverse. The User Configuration menu allows default presentation selection, for Fluoro (usually Normal) and Record (usually Reverse) separately.

Contrast inversion can be combined with Window/Level adjustment.

The User Configuration menu also allows modification of the reverse curve by which dark areas are turned to white and conversely. You can thus adjust the gray level (called D) that remains unchanged when reversing the contrast (called D), and a parameter (called β) setting the contrast in the whites and in the blacks.

When D is increased, the inverted image is darker than the normal image.

When β is increased, the contrast in the blacks is increased, and the contrast in the whites is reduced.

The standard value for D is 98, the standard value for β is 1.3.

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2–6–3 Image flips (left–right, up–down)

Usually, the Patient is positioned so that the right part of anatomy is on the left side of the image screen, and the top part of anatomy, on the top side of the screen. For examination where the Patient is positioned differently, it may be useful to:

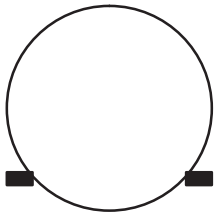
– Mark the sides.

– Reverse the display so that the right part is always be displayed on the left side of the image (and film).

DRS offers this possibility:

There are two specific fields, of two characters each, that may be used to mark the sides:

Illustration 8 – Side–marker fields



– You may enter any indication here (such as R or L, or AP or PA).

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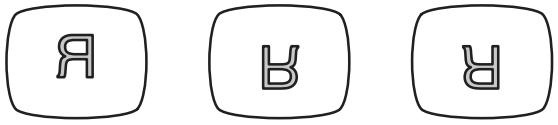
– You can reverse the horizontal display, by pressing Я or ◁— and —▷ simultaneously. The right side will become the left side. An icon is added on top left of the screen, to mark flipped image. The Side fields (see above) are also exchanged.

– You can reverse the vertical display, by pressing ▽ and △ or Ƃ simultaneously. An icon is added on top left of the screen, to mark flipped image. The Side fields (see above) are not modified.

Illustration 9 – Flip icons



Horizontal flip only Side Tags flipped

Vertical flip only

Horizontal and vertical Side Tags flipped

Once an image is flipped, it is stored, retrieved, and filmed this way, and can be returned to the original state at any time.

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2–6–4 Digital shutters

Edges drawn on images by the collimator blades don't appear completely sharp or straight because of enlargement and geometric distortion introduced by the image intensifier.

The blades of lead collimators may be masked by a digital process consisting of superimposing a rectangular black mask on collimated areas of an image. This is especially useful when images are displayed in inverted contrast, as the collimator blades then draw a blooming peripheral area.

	Activate Digital Shutters	Indication of Digital Shutter operating mode	De–activate Digital Shutters
DRS auxiliary console	press on or	lighted–on	Press on or until the digital shutters disappear completely and a bip sounds

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2–6–5 Manual digital shutters

Once the digital shutters are activated, they can be manually moved using the arrow keys:

– opens both vertical digital shutters,

– closes both vertical digital shutters,

– opens both horizontal digital shutters,

– closed both horizontal digital shutters.

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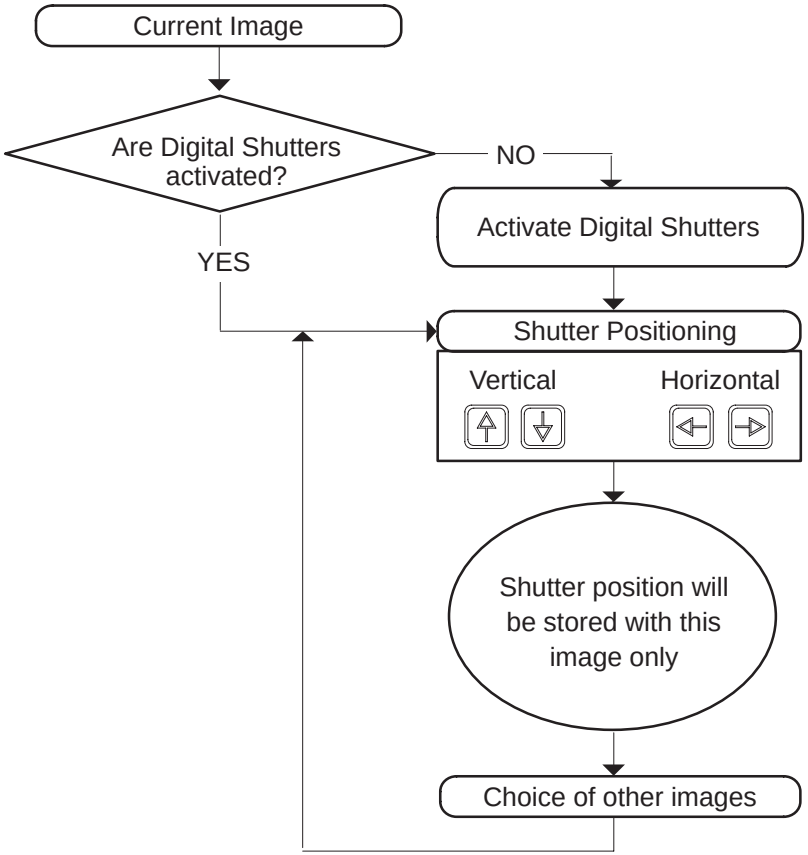
Manual Digital Shutters Procedure



2

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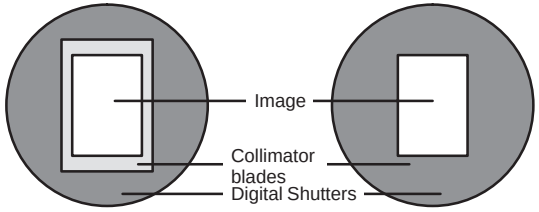
2–6–6 Automatic digital shutters (option)

Positioning the digital shutters:
When this functionality is on, digital shutters will automatically adapt to image full format.

Illustration 10 – Auto shutters and collimator relative positions



Digital Shutters outside the collimator blades (the collimator is visible)

Digital Shutters inside the collimator blades (the collimator is hidden)

The Auto Shutters (depending on system selection) usually have the size of the collimator blades. If the desired default position is slightly different, the User Configuration menu (see para. 3–1 of Chapter 3) allows the default position of Digital Shutters to be selected between five step inside and five steps outside the blade position (one step is approximately equivalent to 8/1000 of the screen size).

Note: In some cases, Auto Shutters will not be able to correctly find the collimator blades. Some examples of images where Auto Shutters will not come in are:

– on Advantx systems with TV rotation, if the image is rotated.
– images with circular collimation.

It is possible to manually reduce the area delimited by the shutters using the arrow keys.

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Automatic Digital Shutters Procedure

Before image acquisition:

Activate the Automatic Digital Shutters

Acquire images

The images appear with a black mask

– After acquisition,
– Review images

Current image

Are Digital Shutters activated?

NO

Activate Automatic Digital Shutters

YES

The image appears with a black mask

Manual Complementary Reduction allowed

Vertical

Horizontal

This reduction will be stored with this image

Possible to copy this reduction to other images

Choose another image

2

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2–6–7 Edge–enhancement filters

Radiographic images, in R&F procedures, require good sharpness. DRS offers digital processing to enhance spatial resolution: Edge–Enhancement filters.

Edge Enhancement is applied to Record images as soon as the Prep button is released. It consists of a set of digital filters that enhance detail, edges, and spatial transitions in an image, and minimize impact on noise and grain.

There is a range of 21 filters, ranked from 0 to 20. The default filter applied to the image as soon as it is recorded is set in the User Configuration menu. The other filters are accessed using the key to increase filter strength, or key to decrease filter strength.

The filter strength is displayed on the bottom right of the image screen, as **SP= 03.**

The filter can be changed at any time. Images are stored, retrieved, and filmed with their own edge–enhancement value, either default or manually readjusted. The edge–enhancement filter of an image can also be propagated onto the next images, using the Copy function (see para. 2–7–4 page 69).

Another filter, identified by the letter E (SP=E) is used to equate the contrasts in order to obtain information from the overexposed or underexposed areas. This filter is selected from the SP=20 filter.

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2–6–8 Zoom (magnifying)

If needed, the image can be magnified, using the key. Although this feature allows refinement of image presentation, it cannot replace a correct selection of the Field Of View.

Press once to display a graphic frame, and move it across the screen using the four Arrows to surround the Region of Interest (ROI) you wish to magnify.

Press a second time to magnify the ROI by 2. It is still possible to roam the displayed image, using the four Arrows, if no function of higher priority is active.

Press a third time to return to 1–in–1.

The images are displayed zoomed, but stored with their original size.

2–6–9 Cine Loop

DRS offers the functionality of Dynamic Sequence Review: when Record images have been taken in sequence (acquisition rate: ≥0.5 i/s), press on any of them to display the whole sequence, in loop, at the rate of exposure.
The Window/Level and Digital Shutters displayed during the loop are that of the image on which the loop was started. However, each image keeps its own attributes.

Press to slow down the loop, and to speed it up to the exposure rate.

Press again to exit the loop.

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2–7 IMAGE PROCESSING

2–7–1 Measurements (Option)

2–7–1–1 Definitions

The DRS system offers the possibility of measuring angles and segments (distances) on stored fluoroscopic and/or radiographic images.

On each image, two angles and their values can be displayed:

– two angles and their values,

– two segments with their values,

– the ratio between them,

– and, on the side of the image, a 50–mm/2–inch graduated scale.

Images and their measurements are stored together in memory. When called up, images are displayed without the angles and segments, which are displayed by pressing the Measurement key .

WARNING

PARAGRAPH 2–7–2 INDICATES THE RESULTANT ACCURACY OF THE MEASUREMENTS. PLEASE READ IT CAREFULLY TO BE AWARE OF THE PRECAUTIONS TO TAKE.

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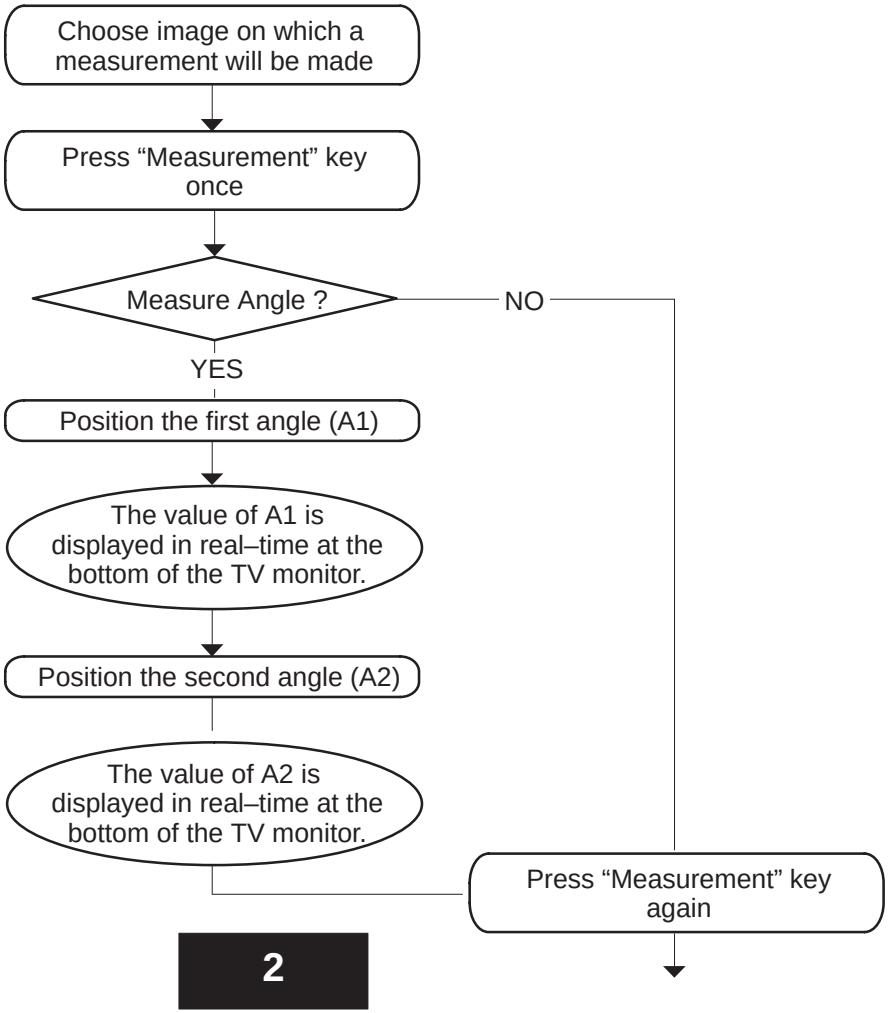
2–7–1–2 Overview on the different measurement methods


Choose image on which a measurement will be made
Press “Measurement” key once
Measure Angle ?
NO
YES
Position the first angle (A1)
The value of A1 is displayed in real–time at the bottom of the TV monitor.
Position the second angle (A2)
The value of A2 is displayed in real–time at the bottom of the TV monitor.
Press “Measurement” key again
2

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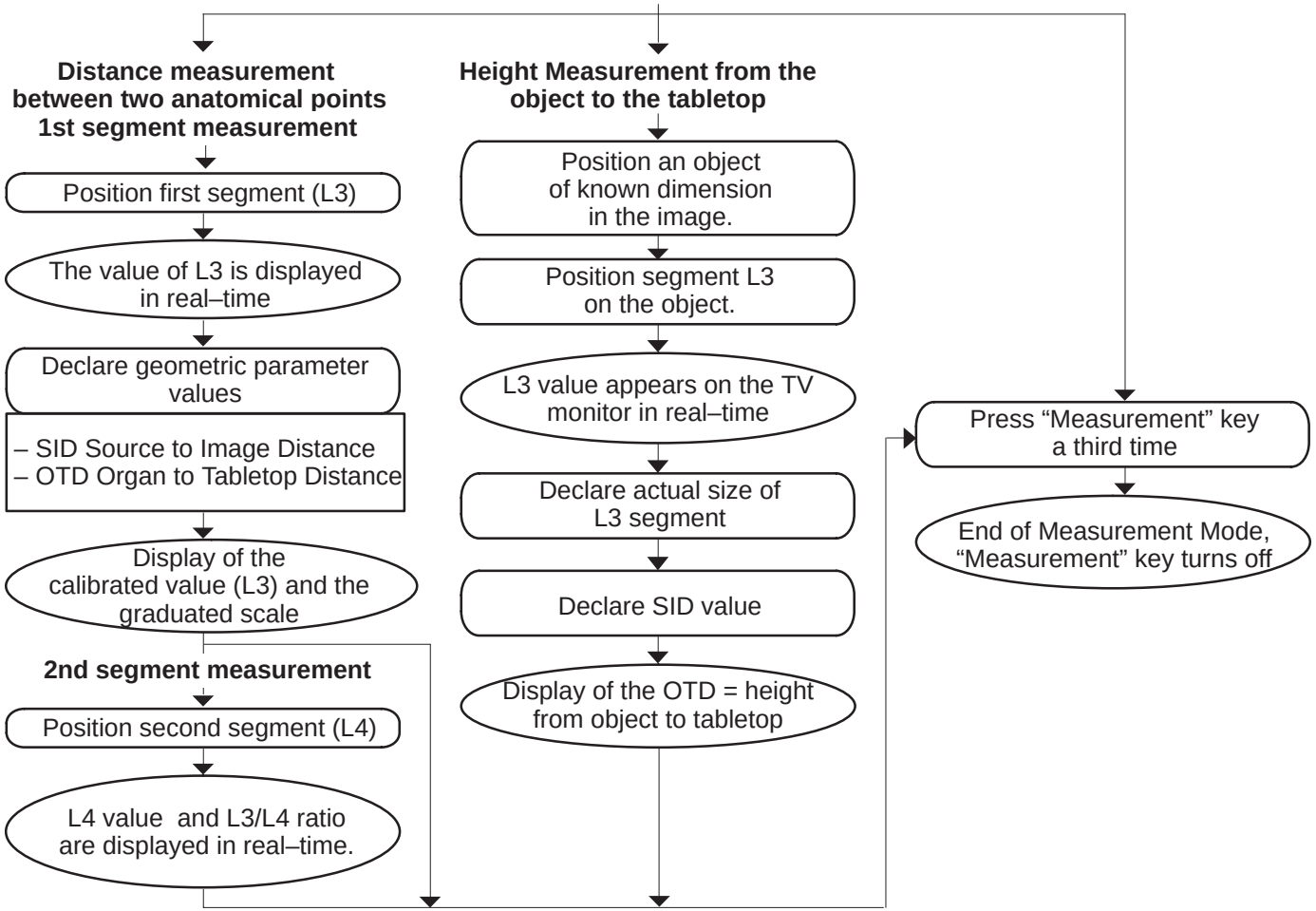
Distance measurement between two anatomical points
1st segment measurement
Position first segment (L3)
The value of L3 is displayed in real–time
Declare geometric parameter values
– SID Source to Image Distance
– OTD Organ to Tabletop Distance
Display of the calibrated value (L3) and the graduated scale
2nd segment measurement
Position second segment (L4)
L4 value and L3/L4 ratio are displayed in real–time.
Height Measurement from the object to the tabletop
Position an object of known dimension in the image.
Position segment L3 on the object.
L3 value appears on the TV monitor in real–time
Declare actual size of L3 segment
Declare SID value
Display of the OTD = height from object to tabletop
Press “Measurement” key a third time
End of Measurement Mode, “Measurement” key turns off

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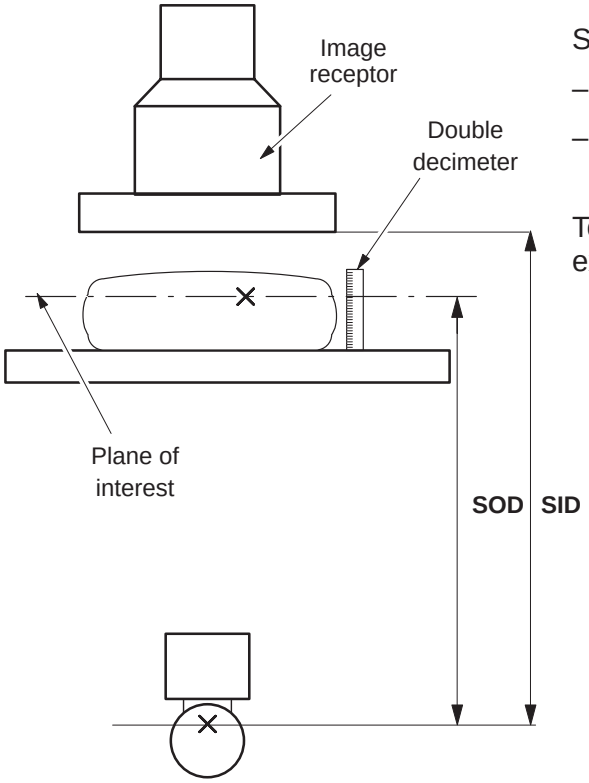
2–7–1–3 Geometric Parameters definition for an Advantx console



SID and SOD geometric parameters definition:

– SID : Source to Image Distance.

– SOD : Source to Objet Distance, = distance between X–ray tube focal spot and plane of interest.

To obtain precise distance measurements, you must know the exact SID and SOD.

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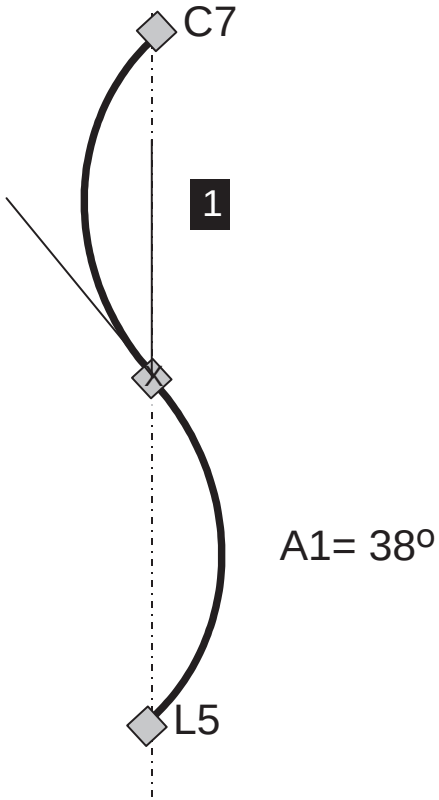
2–7–1–4 Angle measurements – Detailed procedure



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– Position Angle (A1):

  . Press key to display the first angle (A1).

  . A cross automatically appears at the summit of angle (A1). The entire angle can be moved from this point.

  . The value of angle (A1) is displayed in real–time at the bottom of the TV monitor.

  . Place the angle summit by moving it with the 4 Arrow Keys (of either the alphanumeric keyboard or on the touch screen).

  . Press [ENTER] to select the uppermost extremity of the angle (A1) and place it with the Arrow Keys.

  . Press [ENTER] to select the last extremity and place it with the Arrow Keys.

  . Pressing [ENTER] validates angle (A1) placement and then displays angle (A2).

– Position Angle (A2).

  . Angle (A2) is positioned in the same manner as described above.

– Press key to measure distance.

To obtain the best possible measurements, it is necessary to place the angle summit and extremities on the known anatomical points of a same plane, which should be parallel to the tabletop.

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2–7–1–5 Deleting an Angle

a. Choose angle to delete:

   Use the Enter key on the alphanumeric keyboard to switch from one angle to another.

   A cross appears at the summit of the selected angle.

b. Deletion:

   Delete the angle by pressing Shift + Del on the alphanumeric keyboard.

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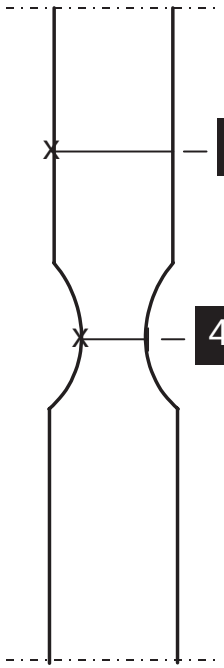
2–7–1–6 Distance between 2 anatomical points – Measurement detailed procedure



L3= 7mm

L4= 4mm

L4/L3 = 57%

Stenosis evaluation example

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– Positioning Segment (L3):

. Press the Measurement key twice to display the first segment (L3).

. A cross automatically appears at the first segment extremity.

. The length of segment (L3) is displayed in real–time at the bottom of the TV monitor. The message “UNCAL” appears at the bottom of the TV monitor as long as the geometric parameters have not been declared.

. Press [ENTER] to mark the segment’s central point This will allow you to shift the entire segment using the “Arrow Keys” (of either the alphanumeric keyboard or the touch screen).

. Press [SHIFT] and [ENTER] simultaneously to return to the segment’s first extremity and position this point using the “Arrow Keys”.

. Press [ENTER] twice to select the second segment extremity. Position this point using the “Arrow Keys”.

. Press [ENTER] to validate segment positioning and to display the message, “Confirm the Calibration Value”. SID and OTD are shown at the bottom of the TV monitor.

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– Declaring Geometric Parameter:
  . Press [ENTER], to position cursor on SID value.
  . Use [Del], to delete current value and enter new value.
  . Press [ENTER] to confirm the new SID value and place cursor on OTD value.
  . Use [Del], to delete current value and enter new value,
    caution, type 0 before any OTD values inferior to 100. Example : 065.
  . Press [ENTER] to confirm new OTD value.
  . The message, “UNCAL” disappears.
– Positioning Segment (L4):
  . Press [ENTER] to display segment (L4).
  . Place segment (L4) in the same way as segment (L3) was placed.
  . Segment (L4) values and segments (L3/L4) ratio values are displayed in real–time at the bottom of the TV monitor.

2–7–1–7 Deleting a Segment

a. Choose segment to delete:

Press the key.

A cross appears at the center of the selected segment.

b. Deletion:

Delete the segment by pressing Shift + Del on the alphanumeric keyboard.

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2–7–1–8 Height from plane of interest to tabletop – Measurement detailed procedure

– First Step: Place an object of known dimensions in the image.

– Reference Segment (L3) Positioning on the Object:

. Press the key once or twice until segment (L3) is displayed.
. A cross automatically appears at first segment extremity.
. The length of segment (L3) is displayed in real–time. The message “UNCAL” appears at the bottom of the TV monitor until the geometric parameter values are defined.
. Press [ENTER] to mark the segment’s center point. This will allow you to shift the entire segment, using the “Arrow Keys” (on the alphanumeric keyboard or touch screen).
. Press the [SHIFT] and [ENTER] keys simultaneously to return to the segment’s first extremity, Position this extremity using the arrow keys.
. Press [ENTER] twice to display the second segment extremity. Position this extremity using the arrow keys.
. Press [ENTER] to validate the segment position and display the message, “Confirm the Calibration Value”. SID and OTD distances are then displayed at the bottom of the TV monitor.

– Define the actual size of reference segment (L3):

. Press [Del] to delete the current value. Enter the new value.
. Press [ENTER], to place the cursor on the SID value.

– Define Source to Image Distance (SID):

. Press [Del], to delete the current value. Enter the new value.
. Press [ENTER] twice to confirm the value, consequently.
. the OTD value changes: this is the new Organ to Tabletop Distance value.

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2–7–2 Measurement accuracy

The nature of X–ray images (anatomies are projected onto a plane) requires some simple precautions to guarantee accurate measurements.
The next two paragraphs summarize respectively the precautions to be taken and the errors which may occur when the procedures are not applied.

2–7–2–1 Basic precautions to be taken to ensure precise measurements

- The central X–ray beam must be perpendicular to tabletop:

  – Advantx TC : No tabletop tilting.
  : No C-arm cranial/caudal/orbital angulation.)

- For calibration using an object, the object size must be at least 1/10th of the field of view.
- On Prestige/Prestilix, a tomography run is recommended to define accurately the height of the anatomy to be measured with respect to the tabletop (OTD).
- The use of the digital zoom is strongly recommended for accurate positioning of segment/angle extremities.
- When performing segment and angle measurement computations, DRS corrects for the image intensifier "pincushion" distortion. However, it is recommended to minimize the length of the segments used for angle construction. When this is not taken into account, the error on the angle measurement can reach the following values:

FIELD	MAX ERROR
N	**11°**
M_1	**8°**
M_2	**5°**
M_3	**3°**

- SID has little influence on angle measurement accuracy; if SID is not correctly entered (User Menu), a maximum error of 2° may occur.

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2–7–2–2 No–Calibration Errors (segment measurements)

The errors which may occur when measuring in extreme situations of anatomy sizes and when proper procedures are not applied are summarized below.

ESTIMATED RELATIVE INACCURACY IN OBJECT LENGTH ON PRESTIGE WITH NO USER CALIBRATION, IF TOMO IS USED TO ESTIMATE OTD			
FOV = 40 cm, as = 40 cm		FOV = 16 cm, as = 0.16 cm, w/ Zoom	
min. SOD & SID	max. SOD & SID	min. SOD & SID	max. SOD & SID
13%	8%	29%	24%

ESTIMATED RELATIVE INACCURACY ON OBJECT LENGTH ON PRESTIGE WITH NO USER CALIBRATION, IF TOMO IS NOT USED TO ESTIMATE OTD			
FOV = 40 cm, as = 40 cm		FOV = 16 cm, as = 0.16 cm, w/ Zoom	
min. SOD & SID	max. SOD & SID	min. SOD & SID	max. SOD & SID
17%	9%	33%	26%

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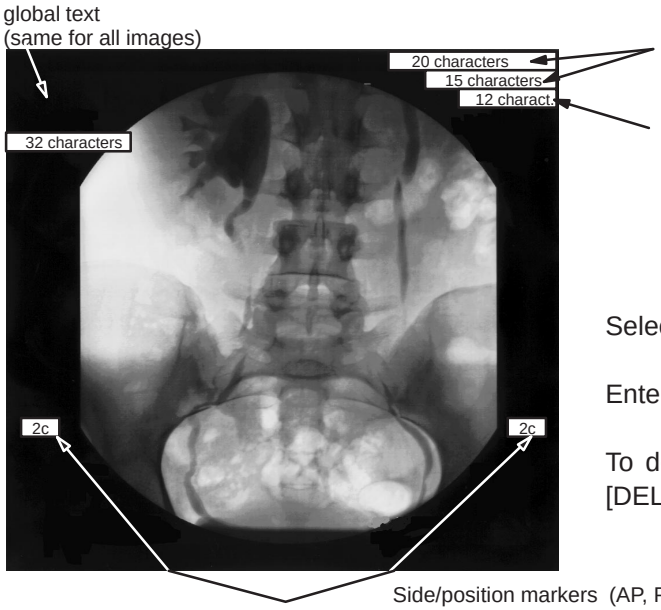
2–7–3 Annotations

2–7–3–1 Introduction

Text (names, comments, etc.) can be entered using the DRS keyboard.

Illustration 11 – Annotations fields



Select line by pressing RETURN as many times as needed.

Enter text (letters/numbers).

To delete the information, press and hold [SHIFT], and press [DEL].

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2–7–3–2 Quick annotate (Dictionary) (Option)

To accelerate input of frequently used text or names, DRS can store a list (Dictionary) of 50 words/sentences of up to 20 characters together with their identifiers (easy–to–remember abbreviations).

To fill/edit text in Dictionary, or simply to remember an identifier, hold [SHIFT] down, and press [?], in one of the cases shown in Illustration 13.

To input or modify text or an identifier, select the desired field (arrows) and use the alphanumeric keyboard. Press ↵ to return to the original screen and store the Dictionary.

Examples of use: see Illustration 14.

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Illustration 12 – Dictionary screen texts and identifiers

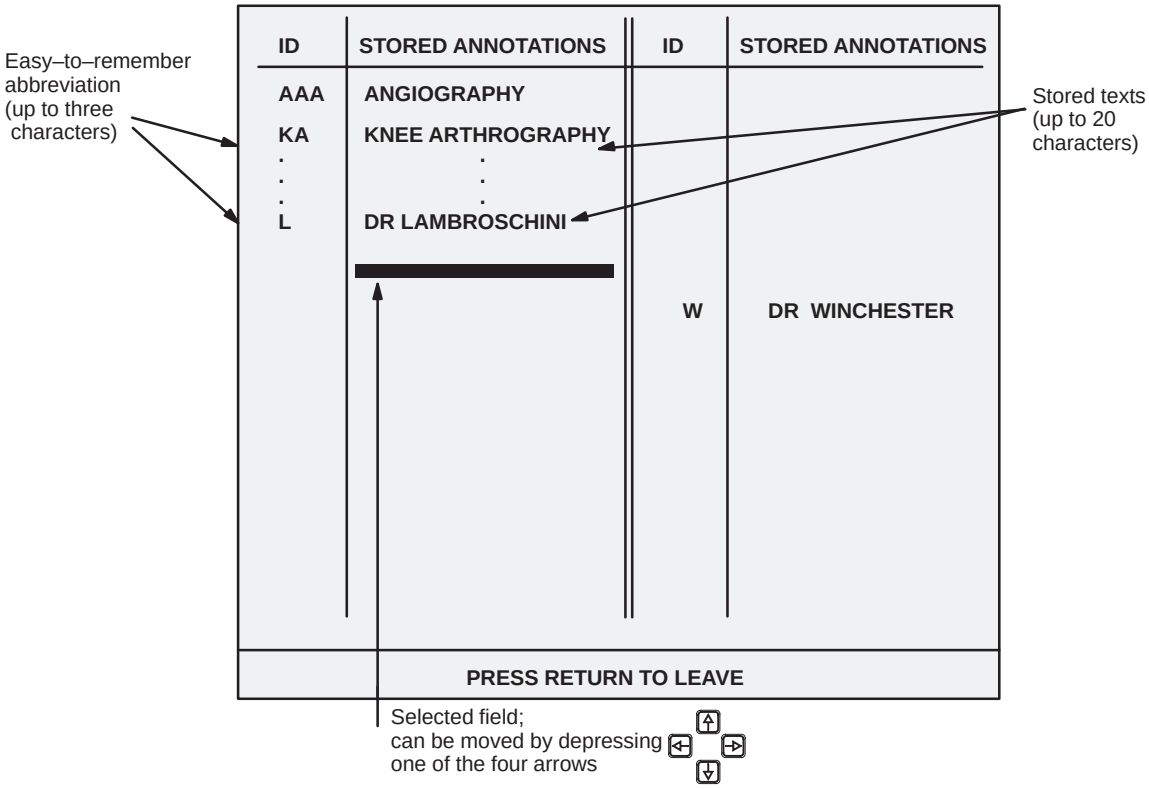

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Illustration 13 – Displaying the dictionary

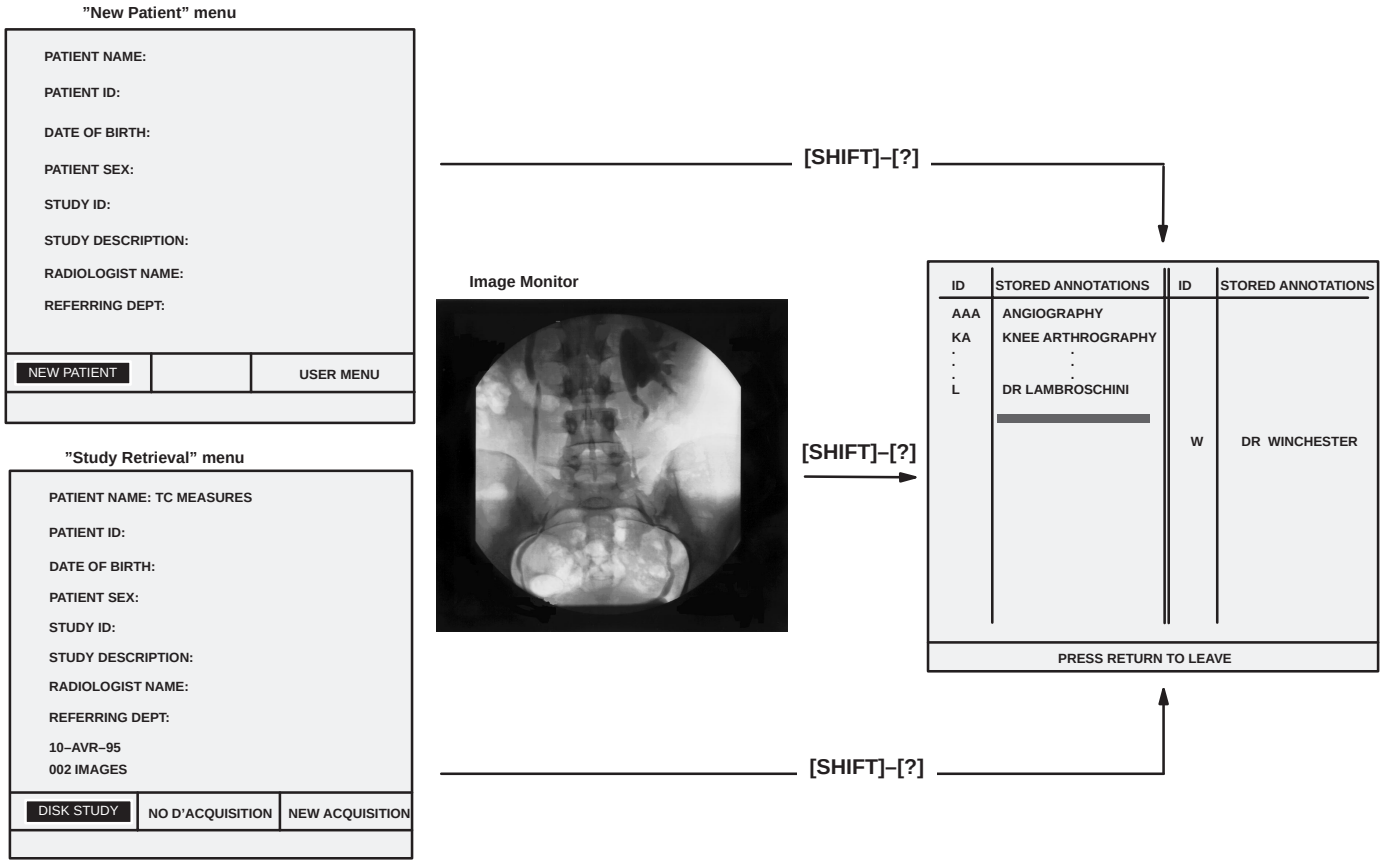

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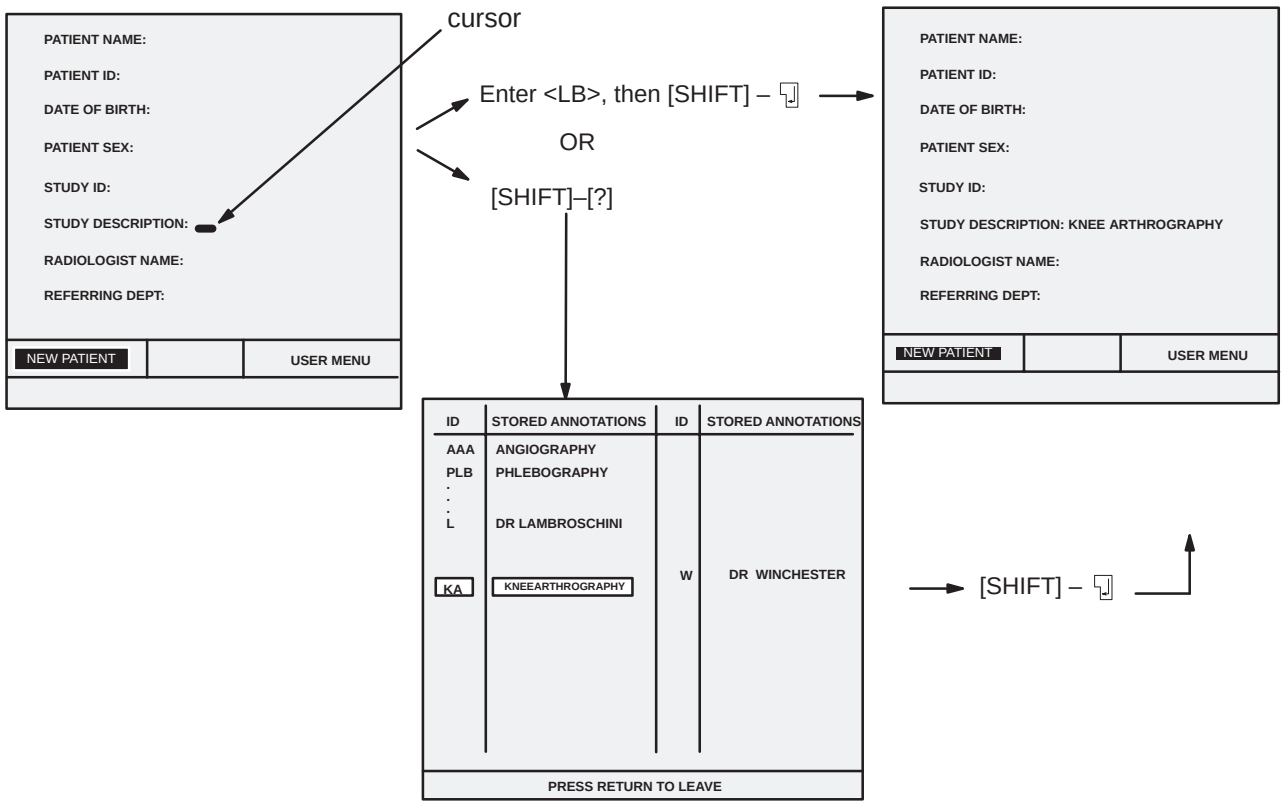
Illustration 14 – Dictionary: examples of use

1) Fast entry of Study Description



2

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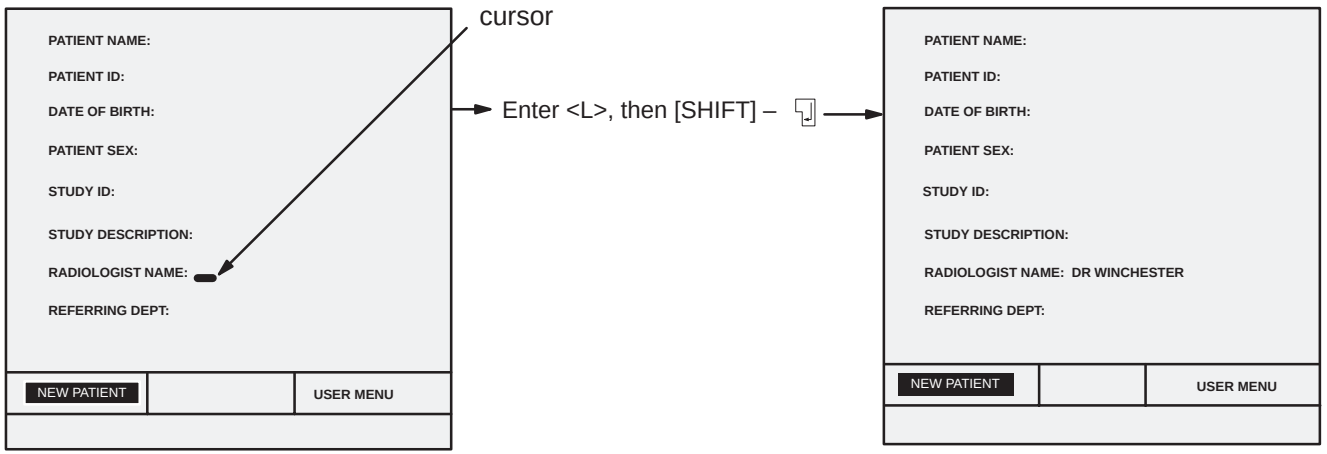
2) Fast entry of Radiologist Name



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2–7–4 Copy (Option)

To speed up post–examination activities, certain image attributes can be copied on the next images:

When the (On) key is pressed, the current values of window/level, annotations, digital collimation, coefficient of measurement calibration if the Measurement key is selected, and edge enhancement are copied on all the subsequent images (but not on images acquired before the current image).

If the key remains activated, the parameters are copied on the next images in real time if window/level is modified, if annotations are added to the image, if the edge enhancement filter is adjusted, or if the digital collimation setting is changed.

Any image whose attributes have been modified via the copy function may still be remodified as usual and its attributes recopied on the next images using the key.

is automatically switched OFF when exiting the study.

2–7–5 Image Deletion

When the SPACE AVAILABLE indicator flashes, some examinations must be deleted from the Patient Directory. Images can also be deleted to gain space.

Press the key twice, with a one second interval between key presses, while the image is displayed in 1-in-1 Mode or in Multiview. A beep is emitted and the Space Available and Current Study counters are updated accordingly.

Note: If the interval between key presses is less than 0.5 seconds or greater than 1.5 seconds, the delete function will not work.

When executed, image/study deletion is permanent, i.e., images cannot be recovered.

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2–8 OVERVIEW AND FILMING

2–8–1 Multiview

The 1–in–1 display mode is well suited for accurate image analysis and diagnosis, but does not allow image comparison, or a broad overview of the study.

DRS offers two additional display modes: 15–in–1 Multiview, and 4–in–1 Multiview.

Press once to display up to 15 images on the same screen, centered on the current image (Illustration 15):

The Window/Level and gray scale applied to the group of images are that of the current image. They can be modified while the Multiview is displayed.

Each image keeps its own Digital Shutters; they are displayed if the (Automatic Mode) key is On, but cannot be adjusted in this mode.

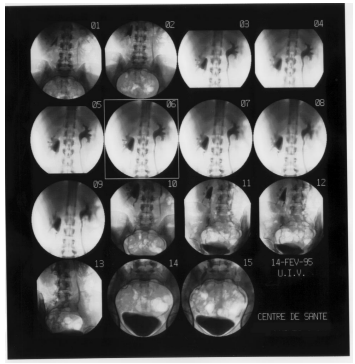

Illustration 15 – 15–in–1 Multiview

Each image can be individually tagged or untagged for Filming or Networking with the (Select) key; an icon appears or disappears in the upper–right corner of the image.

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Images can also be deleted in the collage (Press twice while this image is the current image, i.e., while it is surrounded by a frame). When deleted, images are replaced by a black square. If the Multiview is rebuilt, the deleted images will simply not appear.

Changing the Multiview, to display the next or previous 15 images is possible, using the or key. In this case, the collage is rebuilt, in a way that always displays the maximum number of images on the screen. For instance, if the 15–in–1 Multiview had Images 4 through 18 on display, and is pressed, the screen will show Images 1 through 15.

Illustration 16 – 4–in–1 Multiview

The Frame Number, Select icon, and Fluorostore icon are displayed.

The current image can be changed, using the Arrows.

Press a second time to display up to four images on the same screen. (Illustration 16)

Images are handled as in 15–in–1.

Press a third time to return to 1–in–1, on the current image (Illustration 17).

Illustration 17 – 1–in–1 Multiview

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2–8–2 Filming

Depending on configuration, there are two ways to print DRS images on film:

1. Using the printer control keypad; each image to be printed will be:
   a. Displayed.
   b. Filtered/annotated (where applicable).
   c. Sent to the desired position on film; when the film sheet is fully loaded, an expose function will be activated.

2. Using DRS Film Study and Film Image controls:
   (Film Study and Film Image controls are not available for DICOM printing.)
   [Film Study] (optional, according to configuration) transfers **all** (user) selected images to the printer in background operation; this may be an important time saver given the system capability to perform other activities in parallel with the filming task (new exposures or reviews, for example). DRS takes full control of printer operation (host control) via a 3M® protocol. Para 2–8–2–1, 2–8–2–2, and 2–8–2–3 below describe the host control feature.

2–8–2–1 Film image (Option)

(Film Image function is not available for DICOM printing.)
This function is used to send individual images or menus to the film printer. Images will be printed as displayed (what you see is what you get).
Image transfer is similar to a Prep–Expose process.

Press once; the preparation menu will be displayed (Illustration 18) and the following printer parameters can be changed:

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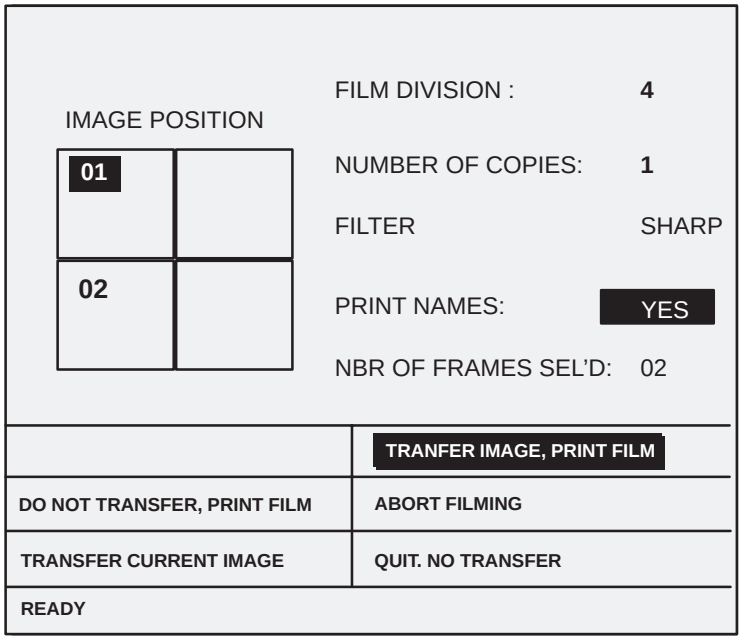
Illustration 18 – DRS printer menu for film image



– Film division (1, 2, 4, 6, 9, or 12, depending on model),
– Image position on film sheet,
– Number of copies (identical film sheets): 1 thru 9,
– Printer filter (sharp or smooth),
– Print/do not print Patient, Physician, and Hospital names.

or keys select the parameter to be changed (the value is displayed in reverse video when selected).

(SELECT) key toggles parameter values and image position.

or keys select the commands (TRANSFER IMAGE, PRINT FILM/DO NOT TRANSFER,PRINT FILM/ etc.).

When printer settings are satisfactory, press Film Image again, the menu is exited and the displayed image is sent to the printer in the selected format.

The key (Print Image) flashes as long as the current task (e.g., TRANSFER CURRENT IMAGE) is not complete; during this period another image transfer is not allowed.

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Printing process starts automatically when the film sheet is full or when exiting the study.

IMAGE POSITION	In FILM IMAGE, the current image is placed by default in the first block left free, and its number is displayed inverted. If IMAGE POSITION is the active parameter, the user can choose to move this image to another free block, using the [SELECT] key, so that on the film, the images will not necessarily be in chronological order.
NUMBER OF FRAMES SELECTED	In FILM IMAGE, it is the total number of images already sent to the laserprinter in this study.
TRANSFER	In FILM IMAGE, TRANSFER CURRENT IMAGE sends the current image to the laserprinter and sends a Print command if the film sheet is full, TRANSFER IMAGE, PRINT FILM sends the current image and then sends a Print command to the laserprinter, DO NOT TRANSFER, PRINT FILM does not send the current image but sends a Print command to the laserprinter, QUIT, NO TRANSFER does not send any command or image to the laserprinter, exits this menu, ABORT FILMING sends an erase command to the laserprinter (erases all images on the current film sheet).

2–8–2–2 Select

This function (SELECT key) is used to select/unselect desired images for filming in FILM STUDY Mode. The User Configuration menu sets either ALL or NO images initially selected for filming.

Press (SELECT) key to tag or untag an image; this can be done in Single or Multiview (4, 15) display modes. An icon is switched On/Off in the upper right of the image.

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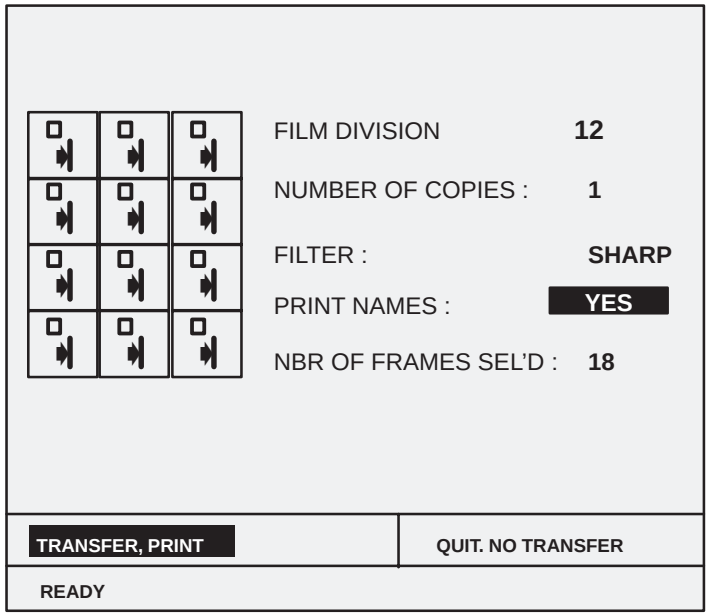
2–8–2–3 Film study (Optional, depending on system configuration)

(Film Study is not available for DICOM printing.)

Illustration 19 – DRS printer menu for film study



All selected images in a study will be transferred to the film printer using the FILM STUDY command. Subtracted images cannot be filmed using Film Study, use Film Image.

(Refer to para. 2–8–2–1 above).

Press Film Study once; the preparation menu is also similar (Illustration 19).

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The values for the parameters and commands are as follows:

IMAGE POSITION	The film outline is displayed, and corresponds to the selected film division. The images will be filmed in chronological order.
NUMBER OF FRAMES SELECTED	This value is filled automatically. It is the total number of images selected for filming.
STATUS OR ERROR	The line normally displays READY. It may also display BUSY, if another transfer is in progress, ERROR, or warnings (FILM LOW or FILM OUT).
PRINT NAMES	Enables/disables printout of Patient, Physician, and Hospital name.
FILM DIVISION	Can be 1, 2, 4, 6, 9, or 12, depending on the type of laserprinter.
FILTER	Sets the filter strength on the laserprinter. Can be SHARP or SMOOTH.
NUMBER OF COPIES	1 thru 9.
TRANSFER, PRINT	TRANSFER, PRINT sends the selected images to the laserprinter and sends a Print command. QUIT, NO TRANSFER does not send any command or image to the laserprinter, and exits this menu. The other commands are inactive in Film Study.

When printer parameter settings are satisfactory, press Film Study again; the selected images will be sent automatically as displayed, with their individual attributes (window/level, filters, etc.).

The (Film Study) key flashes as long as filming is not complete; other filming commands will not be accepted until the current one has been completed; other activities are allowed.

The filming process starts automatically.

FILM STUDY can be aborted by pressing and simultaneously.

In the patient list, the icon appears in the Status column. This icon flashes during filming.

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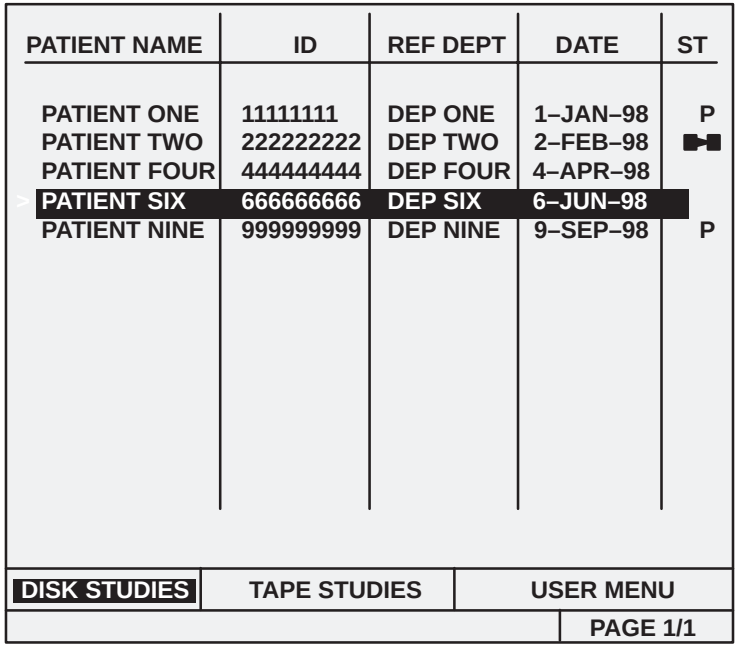
2–9 REVIEWING A STUDY

2–9–1 Patient Directory

Illustration 20 – Patient directory screen



DRS database stores studies on disk and optionally on digital tape. A study may contain several images; each study has a Patient Name and a date of creation. Several studies may have the same Patient Name.

To display the list of studies on disk, press the key:

The and arrows are used to select a study in the list.

The command line gives access to either the optional Tape Directory, or the User Configuration menu. In both cases, the command is selected using the and arrows, and is executed when is pressed a second time.

If [DISK STUDIES] is the selected command, the pointed study is retrieved for review when is depressed.

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The Status [ST] column indicates:

– Protection [P] or non–protection against deletion (no icon or character present) (see para. 2–9–3).

– The last command applied to a study (for example, Study Filming, Archiving, or Networking). One, two, or all of these commands can be activated simultaneously for one or several studies.

	This study is being, or has been study–filmed. This icon flashes during filming.
T	The study has been tagged for archiving on tape. Obtained by entering <T>. Flashes during archiving
	The study has been transferred to tape.
N	The study has been tagged for transfer to a customer workstation on Ethernet network (Dicom 3). Obtained by typing N. Flashes during transfer.
	This study has been sent on Ethernet network.
P	No transfer has been requested, but the study is protected against deletion. Obtained by typing P. Image deletion is still possible inside the study. Press [SPACEBAR] to unprotect.
	This study is unprotected and can be deleted.

When the Status [ST] column of a study is not empty, the study is protected against deletion.

To page through the directory pages (up to four), press the / keys (cursor will move to top of new page), or / .

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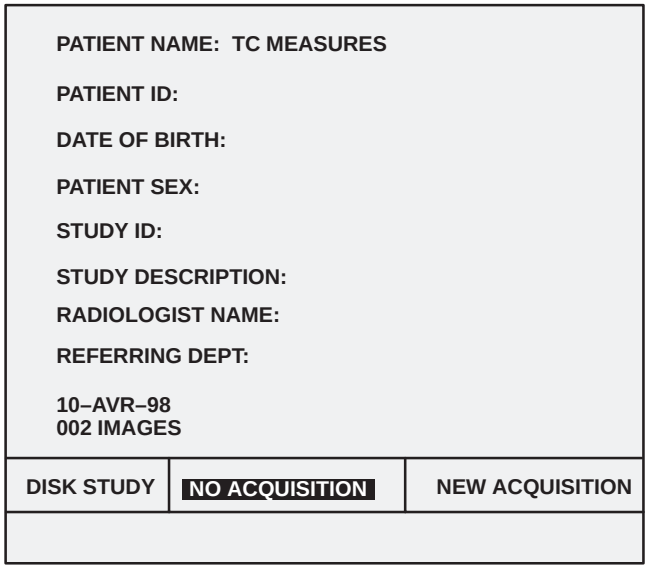
2–9–2 Study Review

When is pressed while a study is pointed for review, this study starts being retrieved from disk and the following screen is displayed:

Illustration 21 – Retrieval menu



The demographic data can be modified in this screen: use the alphanumeric DRS keyboard to type in the new data, and use [RETURN] to move from field to field.

The default command is NO ACQUISITION. If this command is active when exiting this screen, the study will be reviewed, but new exposures will not be allowed for this patient.

Use the and Arrows to change the command, if needed, to move to NEW ACQUISITION if you wish to make new exposures for the patient, or to DISK STUDIES to return to the Patient Directory.

The command will be executed and the menu is exited by pressing again.

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2–9–3 Study Deletion

Studies remain on disk until you decide to delete them.

Press twice, with a one second interval between key presses, while the study is selected (displayed in reverse) in the Patient Directory, or while the Retrieval menu is displayed.

Note: If the interval between key presses is less than 0.5 seconds or greater than 1.5 seconds, the delete function will not work.

When command is given, it cannot be canceled, and images are permanently erased from the disk.

To avoid accidental study deletion, protect studies by entering <P>. This protects the study from deletion. To unprotect a selected study, press Spacebar.

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2–9–4 Deletion of several studies

1. First, protect your exams by using the letter P.
2. In the List of Studies Menu, place the cursor on User Menu.
3. Press Patient Directory . The User Menu appears.
4. Using the horizontal arrow keys , place the cursor in the Exam Deletion area
5. Press the Select key.
   The following message appears:

   ```
   DELETE ALL UNPROCTECTED STUDIES. ARE YOU SURE? (YES/NO)
   WARNING: DELETING STUDIES IS IRREVERSIBLE!
   ```

   Answer YES or NO.
   If you answered YES, the following message appears quickly:

   ```
   DELETE ALL UNPROTECTED STUDIES.  PLEASE WAIT ...
   ```

   followed by the message:

   ```
   ALL UNPROTECTED STUDIES DELETED
   017 Studies          004 Deleted      013 Protected
   ```

6. Press Patient Directory to go to the Study Menu.

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2–10 REMOVING POWER FROM THE SYSTEM

Before removing power from the system, press the key to display the patient directory screen.

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3 – ADVANCED FUNCTIONS

3–1 USER MENU

Some functionalities depend on parameters which may vary from user to user. DRS allows the value of these parameters to be changed through a User Configuration menu.

Select the User Menu command in the Patient Directory or New Patient screen, before pressing the or key.

The 4 pages of the User Menu are displayed in Illustration 22, Illustration 23 and Illustration 24.

(Parameters shown are given as examples).

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Illustration 22 – User configuration menu – page 1/4

USER MENU

LANGUAGE : ENGLISH DATE : DD–MM–YY TIME : HH–MM–SS ON

HOSPITAL NAME:

DEFAULT WINDOW (DIRECT) W : *255* L : *127*
(INVERT) W : *255* L : *127* D : 098 BETA : 1.3

			– RAD –	– FLUORO –
WINDOW			REVERSE	NORMAL
EDGE	*ON*	DEFAULT :	*0.4*	*03*
FNR	*ON*	DEFAULT :		*04*

– PRINTER –

IMAGE SELECT *NONE* TYPE : *3M952*

KEYBOARD : *INTERNAL(SEE NOTE)*

– MEASUREMENT –

UNIT : cm DEFAULT SID : 105 SOD : 0100 **(*)**

– SHUTTER – OFFSET : +1

– SUBTRACT –

DEFAULT WINDOW W: 170 L: 085

SUBTRACTED FLUORO: *ON*

CHANGE PARAMETERS	DEFAULT PARAMETERS	DISPLAY PATTERN
FORMAT TAPE	DELETE ALL STUDIES	PING
Answer for Ping :"Alive" or "No Answer" or reset message		PAGE 1/4

(*)	
OTD	Prestilix, Prestige
SOD	Advantx TC, Legacy

Note: This selection will be changed to "external" if you have the DRS Gateway option installed on your system. Contact an authorized GE representative to change the configuration.

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Illustration 23 – User configuration menu – pages 2/4 & 3/4 (optional)

USER MENU

– NETWORK – **TRANSFER TO STATION NUMBER :** *1*

STATION 1	ADDRESS:	*address*	PROTOCOL: *FTP*
	USER:	*user*	
	PASSWORD:	*password*	
	DIRECTORY:	*directory*	
	GATEWAY ADDRESS:	*address*	
STATION 2	ADDRESS:	*address*	PROTOCOL:*DICOM*
	A.E. TITLE:	*Application Entity Title* (see note)	
	PORT NUMBER:	*Port Number*	
	GATEWAY ADDRESS:	*address*	
STATION 2	ADDRESS:	*address*	PROTOCOL: *DICOM*
	A.E. TITLE:	*Application Entity Title* (see note)	
	PORT NUMBER:	*Port Number*	
	GATEWAY ADDRESS:	*address*	

CHANGE PARAMETERS	DEFAULT PARAMETERS	DISPLAY PATTERN
FORMAT TAPE	DELETE ALL STUDIES	PING
Answer for Ping :"Alive" or "No Answer"		PAGE : 2/4

USER MENU

– NETWORK – **TRANSFER TO STATION NUMBER :** *1*

STATION 4	ADDRESS:	*address*	PROTOCOL: *DICOM*
	A.E. TITLE:	*Application Entity Title* (see note)	
	PORT NUMBER:	*Port Number*	
	GATEWAY ADDRESS:	*address*	
STATION 5	ADDRESS:	*address*	PROTOCOL: *FTP*
	USER:	*user*	
	PASSWORD:	*password*	
	DIRECTORY:	*directory*	
	GATEWAY ADDRESS:	*address*	
DRS	ADDRESS :	*DRS Internet (decimal) & Ethernet Addrs (hex)*	
	SUBNET MASK:	*xxx.xxx.xxx.xxx.*	
	STATION NAME:	*xxxxxxxxxxxxxx*	
	A.E. TITLE:	*Application Entity Title (see note)*	

CHANGE PARAMETERS	DEFAULT PARAMETERS	DISPLAY PATTERN
FORMAT TAPE	DELETE ALL STUDIES	PING
Answer for Ping :"Alive" or "No Answer" or Reset message		PAGE : 3/4

CAUTION

With the NETWORK option:
Do not modify the STATION parameters without consulting a GEMS Field Engineer first. The DRS Gateway must match the configuration of the DRS 3.2.

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Note: If configured in software, the "Application Entity Title" will allow multiple destinations on one selection, (i.e. "Contact PACS" will send information both to a DICOM printer and to a PACS storage device).

Illustration 24 – User configuration menu – page 4/4 (optional)

USER MENU			
– NETWORK –	**GET PATIENT LIST FROM STATION**	*6*	
STATION 6	ADDRESS:	*address*	
	A.E. TITLE:	*Application Entity Title*	
	PORT NUMBER:	*Port Number*	
	GATEWAY ADDRESS:	*address*	
STATION 7	ADDRESS:	*address*	
	A.E. TITLE:	*Application Entity Title*	
	PORT NUMBER:	*Port Number*	
	GATEWAY ADDRESS:	*address*	
STATION 8	ADDRESS :	*address*	
	A.E. TITLE:	*Application Entity Title*	
	PORT NUMBER:	*Port Number*	
	GATEWAY ADDRESS:	*address*	
CHANGE PARAMETERS	DEFAULT PARAMETERS	DISPLAY PATTERN	
FORMAT TAPE	DELETE ALL STUDIES	PING	
Answer for Ping :"Alive" or "No Answer" or Reset message		PAGE : 4/4	

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In each of the four pages of this menu, the parameter block and the Command block (at bottom of screen) are handled as follows:

– Press the and keys to switch from one page of the menu to another.

– Press or to select one command (the command is in reverse video when selected).

– Press [SELECT] to execute the selected command.

– If CHANGE PARAMETERS is the selected command, press or to select one parameter (the value is in reverse video when selected).

– Press to confirm the parameter to be changed (the value in reverse flashes).

– Press or to change the parameter value (for the parameters in italics), or type the new data (for the parameters in bold).

– Press to confirm the new value.

– Press or to exit the menu.

The following message “Reset DRS to update the network modifications” is displayed in the left command of the User Menu screen.
To reset DRS, turn the entire system OFF/ON.

The selected parameters are updated when exiting the menu.

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The values for the parameters are:

Page 1/4 :	
LANGUAGE	English, French, German, Spanish, or Italian. All menus, screens, and messages will be displayed in the selected language.
HOSPITAL NAME	Any character chain (two lines). Displayed on the bottom left of the image screen.
DATE AND TIME	Displayed on the bottom left of the image screen if set to On.
INVERT WINDOW – D & BETA	Parameters of the Contrast Invert curve. D = 1 thru 255 (step = 1), Beta = 0.1 thru 10.0 (step = 0.1). Default is D = 98, Beta = 1.3.
DEFAULT WINDOW (DIRECT & INVERT)	Window / Level applied the first time the knobs are touched. W = 4 thru 999 (step = 1), L = 1 thru 255 (step = 1). Default is L = 127, W = 255.
RAD and FLUORO WINDOW	Default Contrast Invert applied at acquisition. Reverse for white barium, Normal for black barium.
FNR	On or Off. Default is On. Off should be used for Service images only.
DEFAULT FNR	FNR applied the first time fluoro is run in a new study. 0 (for no FNR) thru 13 (max FNR) (step = 1). Default is 8.
EDGE	On or Off. Default is On. Off should be used for Service images only.
RAD and FLUORO EDGE FILTERS	0 thru 20 for each. In Record, the value sets the default post–edge filter. In Fluoro, the value sets the acquisition edge filter. Default values are 6 for Record and 4 for fluoro. – E is the equalization filter.
IMAGE SELECT	Image initial selection for Study Filming and Networking. All or None. Default is None.
PRINTER TYPE	P831, M952, or HQ969, depending on printer used. Default is M952.
PRINTER KEYBOARD	Printer control. Internal for DRS emulation of the printer keyboard, or External for keyboard supplied with the printer. Default is Internal. Internal is necessary for the Study Filming function.

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MEASUREMENT UNIT	Unit in which lengths will be displayed. INCHES or CM (centimeters). Default = cm.
DEFAULT SOD, SID	PRESTIGE/PRESTILIX | Other | TC **SID by default 105 cm | | 105 cm** SID min 100 cm | | 80 cm SID max 160 cm | | 160 cm **SOD by default N/A | to be filled | 900 cm** SOD min N/A | at installation | 200 cm SOD max N/A | | 1600 cm **OTD by default 100 mm | | N/A** OTD min 0 | | N/A OTD max 800 mm | | N/A
SHUTTER OFFSET	–1 thru +5: number of steps between the detected position of collimator blades and the digital shutters displayed. 1 step = 8 pixels. –1 means digital shutters are 1 step inside the blades, +1 means 1 step outside. Default = +1.
SUBTRACT DEFAULT WINDOW SUBTRACTED FLUORO	W= 4 to 999 (step 1) ; L=1 to 255 (step 1). Default is L=170, N=085. ON/OFF. Default value is ON.
Other pages:	
STATION NUMBER	For optional networking, eight stations may be defined (1 thru 8). The characteristics of the eight possible stations are given in the next parameters.
NETWORK PROTOCOL	DICOM or FTP. Default is DICOM.
ADDRESS	Internet address(es) of the image receiving device(s) or patient data provider(s), in decimal. Format: xxx.xxx.xxx.xxx (15 characters).
USER	User name under which data will be stored on the receiving device. Used only if the network protocol is ftp. 32 characters. The receiving user name is in lowercase characters.

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PASSWORD	Password of the user name under which to transfer data on the receiving device. Used only if the network protocol is ftp.
DIRECTORY	Directory under which to transfer data on the receiving device. Used only if the network protocol is ftp. 32 characters.
PORT NUMBER	4006 by default.
GATEWAY ADDRESS	The IP address of the router. If this field is modified, the DRS must be rebooted to have this parameter taken into account *.
A.E. TITLE	Application Entity Title of the Workstation for Dicom protocol. This field is user configurable (16 characters.)
DRS A.E. TITLE	For Dicom protocol. The Application Entity Title of the DRS. This field is user configurable (16 characters.)
DRS ADDRESS	DRS Internet address, in decimal. Format: xxx.xxx.xxx.xxx DRS Ethernet address, in hexadecimal (xx:xx:xx:xx:xx:xx:), not modifiable.
SUBNET MASK	The format of this field is xxx.xxx.xxx.xxx. If this field is modified the DRS must be rebooted to have this parameter taken into account *. Example: for a class C network: 255.255.255.0. (the three first fields of the subnet mask are for the network address and the last field indicates the number of the DRS in the network.)
DRS STATION NAME	This is the name by which the DRS is known on the network

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All parameters are stored in non–volatile RAM, so that they are kept when DRS is switched off.The commands in this menu are:

The commands in this menu are:

CHANGE PARAMETERS	This is not a command; it is the only state in which the parameters can be changed.
DEFAULT PARAMETERS	Resets the parameters to the default values (see table above). A message (ARE YOU SURE (Y/N)) is displayed.
DISPLAY PATTERN	Displays the global pattern on all video monitors. Press [SELECT] to exit the pattern. While displayed, the pattern can be filmed using the FILM IMAGE key as with any other image.
FORMAT TAPE	Formats the current tape (if Archiving option is operational). this erases all studies previously stored on the tape. For safety, this command will first ask for confirmation: a message (FORMAT TAPE, ARE YOU SURE (Y/N)?) is displayed.
DELETE ALL STUDIES	Allows to delete from disk all studies that are not protected. For safety, this command will first ask for confirmation: a menu is displayed, with the message (DELETE ALL UNPROTECTED STUDIES, ARE YOU SURE (YES/NO)?). The number of studies deleted and still to be deleted is then displayed. Press one of the four ARROWS to exit this menu.
PING	To check whether the selected target workstation is alive, perform a ping test. Confirm only after the network parameters have been correctly entered.
Answer of Ping or reset message	The result of the Ping can be ”Alive” or ”No Answer”. The following message : ”Reset DRS to update the network modifications” is displayed when one the following parameters: ADDRESS or GATEWAY ADDRESS or SUBNET MASK is modified **Note : To reset DRS systems, turn the entire system OFF/ON.**

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3–2 ARCHIVING ON TAPE (OPTION)

The magnetic tape is a long–term digital archiving media with a high capacity, well suited to Image Archiving.

If the Archiving option is operational on your system and a DRS tape is in place, the following functions are available:

Illustration 25 – DRS Tape directory

	PATIENT NAME	ID	REF DEPT	DATE
	PATIENT ONE	11111111	DEP ONE	1–JAN–98
	PATIENT TWO	222222222	DEP TWO	2–FEB–98
	PATIENT FOUR	444444444	DEP FOUR	4–APR–98
>	PATIENT SIX	666666666	DEP SIX	6–JUN–98
	PATIENT NINE	999999999	DEP NINE	9–SEP–98

PAGE 1/1

– Store studies on the tape: in Patient Directory, enter <T> for each study to be archived (see page 78).

– Format the tape (see page 91).

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3–2–1 Study retrieval on magnetic tape

While the Patient Directory is displayed, select Tape Studies in the command line and press . The directory of the studies stored on tape is displayed (see Illustration 25), and the Space Available counter on the DRS console gives the available space on the tape:

– Select the desired study using the and Arrows, and and to change page.

– Enter <**R**> on the DRS keyboard to start retrieving the study from tape. You may do this for several studies in parallel.

– To go back to the disk directory, press while the selected command is Disk Studies. During study retrieval from tape, they appear in the Disk Directory, with the tape icon flashing, and the Space Available display on the DRS console decrementing with each new retrieved image.

– If the disk is filled up during a retrieval, the study being retrieved is erased from the disk (NO PARTIAL RETRIEVAL), and a warning message is displayed.

– As with archiving, retrieval is a background task that does not prevent you from reviewing or acquiring other images.

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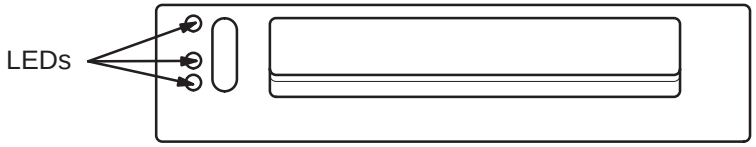
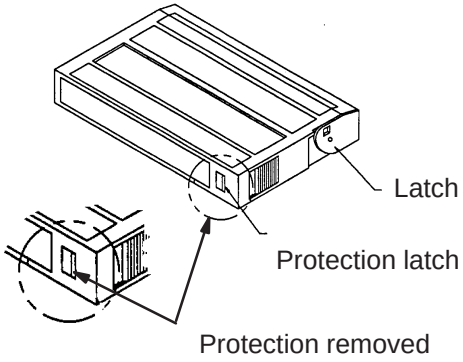
3–2–2 Operation of ELIANT 820 Exabyte tape recorder

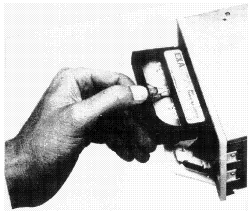
- Environmental requirements:
  - 5 °C to 40 °C
  - 40 % humidity
- Magnetic tape:
  - 15 m 600 MB



- Write protect (including formatting)



- Introduction



CASSETTE

- Recording: EXATAPE 8–mm Data Cartridge
- Cleaning: 8–mm Cleaning Cartridge
  Recommended for ELIANT 820 Exabyte tape recorder

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LED	COLOR	SIGNAL	MEANING
Top	Amber	Flashing	The tape drive either has an error or needs to be cleaned.
Middle	Green	Flashing	SCSI bus activity is occurring.
Bottom	Green	On	Tape is loaded.
		Flashing	Either tape motion is occurring or tape drive needs cleaning.

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3–3 NETWORKING DICOM 3 (OPTION)

With the appropriate option installed and configured, DRS supports five Dicom 3 Service Classes on an Ethernet based network:

- Image Send
- DICOM Print
- Modality Perform Procedure Step
- Worklist Management
- Storage Commitment

3–3–1 Image Send

Networking allows sending selected studies/images in Dicom 3 format on powerful review workstations, such as Advantage Windows.

There are several possible network configurations, from point–to–point to local network. Check the configuration of your system with your System Administrator. In the case of a local network, the DRS must be declared on the network, and an IP address must be given to your DRS by the System Administrator, who will also communicate the IP address of the receiving workstations to which you wish to be connected (up to five), and the Userid, Password, and Directory under which the Studies will be stored.

To communicate with the Review Workstation(s), you must first enter all of the information in the User Configuration menu (see para. 3–1 of this chapter). Your DRS is then ready to transfer studies to the workstation(s).

Make sure that only the images you wish to review on the workstation are tagged with the Select icon. This will save time (the transfer can take tens of minutes, depending on network traffic) and space on the Review Workstation.

The network transfer is a background task and allows other parallel activities such as new exposures or review.

Exams are selected from the patient directory and transmission is started by pressing <N> (network) on the DRS keyboard. Transfer of several studies can be started in parallel.

The Network icon starts to flash in the status column; flashing stops at the end of transmission.

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3–3–2 Worklist Management (option)

Also referred as “HIS–RIS”, this option allows patient data transfer from a hospital data base to DRS. This avoids the need for new patient data to be entered manually at DRS console, saving time and reducing errors.

Operation requires the hospital “HIS–RIS” system to comply with Dicom 3 standard.

Data transfer can be requested while other DRS tasks are in progress (e.g. tape archiving, filming). The only exception is that worklist data and image data cannot be transferred at the same time.

DRS records each set of patient received from the hospital data base. Patient information already existing in DRS data base is ignored. If exceptionally, the study ID is not supplied in the worklist, DRS will create one, for safety.

Up to three hospital workstations (worklist providers) may be specified as patient data sources; only one of them is selected at one time (DRS User Menu, Illustration 24).

Unscheduled or trauma patients that do not match the worklist will either be forwarded or stopped at the DRS Gateway.This action depends upon the software configuration selected at time of installation.

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3–3–2–1 Set up

Please refer to Illustration 23 and Illustration 24.

On page 3/4 of the User Menu (Illustration 23) an entry is available for the DRS Station Name; this is the name under which the DRS is known on the network.

Use page 4/4 of the User Menu (Illustration 24) to specify and select the hospital workstation(s) which are to provide patient data.

Up to three workstations, numbered 6, 7 and 8, may be specified.

For each station to be used, obtain the necessary information from your hospital network administrator and enter the parameters on the screen:

ADDRESS	Internet address (15 characters, decimal; format: xxx.xxx.xxx.xxx)
A.E. TITLE	Application Entity Title (up to 16 characters)
PORT NUMBER	4006 by default.
GATEWAY ADDRESS	Router IP address, if required (15 characters, decimal; format: xxx.xxx.xxx.xxx)

The number of the station currently selected, from which data will be transferred, is shown at the top of the page (GET WORKLIST FROM STATION).

This number can be changed at anytime. By default, station 6 is selected.

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3–3–2–2 Operation

To use the patient data transfer facility, first display the Patient Directory in the usual way by pressing the key.

Illustration 26 – Patient directory screen

PATIENT NAME	ID	REF DEPT	DATE	ST
PATIENT ONE	11111111	DEP ONE	1–JAN–98	P
PATIENT TWO	222222222	DEP TWO	2–FEB–98	
PATIENT FOUR	444444444	DEP FOUR	4–APR–98	
> PATIENT SIX	666666666	DEP SIX	6–JUN–98	
PATIENT NINE	999999999	DEP NINE	9–SEP–98	P

DISK STUDIES | REMOTE WORKLIST | USER MENU

TAPE STUDIES | PAGE 1/1

Messages appear here

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When the option is installed, an additional command, REMOTE WORKLIST, appears in the center of the command line at the bottom of the screen. The command TAPE STUDIES is moved to the bottom left of the screen.

To transfer data, select REMOTE WORKLIST (using the and arrows), and press .

Note: The worklist may be configured in software to query on the Application Entry Title, and/or the Date and/or the Modality. This selection takes place at the initial installation. Please contact a service professional to have this configuration changed.

The DRS then sends a transfer request to the selected hospital workstation, and the command changes to ABORT WORKLIST until the transfer operation is complete. Note that the transfer may take several minutes, depending on network loading and the number of exams in the hospital data base.

Select ABORT WORKLIST to stop the data transfer.

The patient information returned by the workstation is automatically added to the Patient Directory, and can then be accessed in the usual way.

If the transfer has been interrupted by selecting ABORT WORKLIST, new patient data received before the transfer was stopped remains in the DRS data base.

Messages are displayed at the bottom of the screen to indicate data transfer progress, warnings, etc... These are described below.

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3–3–2–3 Messages

Messages to indicate data transfer progress are displayed at the bottom of the Patient Directory screen.

INFORMATION MESSAGES

These messages indicate normal progress of data transfer:

WORKLIST REQUEST IN PROGRESS
Message indicating that the REMOTE WORKLIST command has been selected.

yy WORKLIST ITEMS RECEIVED, – xx CREATED
Message indicating successful completion of data transfer; yy is the total number of patient records received, xx is the number of new records created by the DRS.

IMAGE TRANSFER RUNNING, PLEASE RETRY LATER
The requested patient data transfer is not possible because an image transfer is in progress.

WORKLIST IN PROGRESS, PLEASE RETRY LATER
The requested image transfer is not possible because a patient data transfer is in progress.

ABORTING WORKLIST REQUEST
This message is displayed after the ABORT WORKLIST command has been selected.

WORKLIST REQUEST ABORTED
This message is displayed after the ABORT WORKLIST process has been completed.

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WARNING AND ERROR MESSAGES

These messages indicate problems with data transfer:

REMOTE SERVER NOT READY

The selected hospital workstation is not responding, and may have been powered off.

WORKLIST APPLICATION NOT PROPERLY CONFIGURED

a. The WORKLIST function is not correctly configured in page 4/4 of the User Menu.
b. The hospital workstation DICOM settings are not correct for the transfer request. Call service.

REMOTE SERVER APPLICATION NOT RESPONDING

The hospital workstation DICOM process is not responding; either the application has not been started, or it is not correctly configured (wrong A. E. Title or port number).

DRS DATABASE IS FULL

The DRS cannot add new patient data because of a no space left error or other reason related to the database. Clean the database or call service.

INVALID DATA RECEIVED FROM WORKLIST SERVER

The DRS has received a Worklist data structure in which one or more fields do not comply with the DICOM specification. The software error code is displayed on the screen.

INSUFFICIENT DATA RECEIVED FROM WL. SERVER

The DRS has received a Worklist data structure in which on or more mandatory fields are missing in one or more Worklist items. The software error code is displayed on the screen.

WORKLIST INTERNAL ERROR

An internal worklist error has occurred. Call service.

NETWORK COMMUNICATION ERROR

A network error has occurred. Check User Menu worklist parameters and network settings and try again. If the error continues, call service.

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3–3–3 DICOM Print (option)

Networking allows sending selected studies/images in Dicom 3 format on powerful review workstations, such as Advantage Windows.

There are several possible network configurations, from point–to–point to local network. Check the configuration of your system with your System Administrator. In the case of a local network, the DRS must be declared on the network, and an IP address must be given to your DRS by the System Administrator, who will also communicate the IP address of the receiving workstations to which you wish to be connected (up to five), and the Userid, Password, and Directory under which the Studies will be stored.

To communicate with the Review Workstation(s), you must first enter all of the information in the User Configuration menu (see para. 3–1 of this chapter). Your DRS is then ready to transfer studies to the workstation(s).

Make sure that only the images you wish to print on the workstation are tagged with the Select icon. This will save time (the transfer can take tens of minutes, depending on network traffic).

The network transfer is a background task and allows other parallel activities such as new exposures or review.

Network operations are background tasks on the DRS which are interruptable by x–ray acquisitions. Therefore, large multi–format film operations to the network can be temporarily interrupted. This could have the effect of causing images to be spread out onto multiple sheets of film. For example: twelve images on a 12 on 1 format could end up on two or three sheets of film if interrupted by an x–ray acquisition.

Exams are selected from the patient directory and transmission is started by pressing <N> (network) on the DRS keyboard. Transfer of several studies can be started in parallel.

The Network icon starts to flash in the status column; flashing stops at the end of transmission.

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The DRS Gateway adds the DICOM Print functionality to the DRS. Specific network stations must be configured in the user menu to allow the DRS to print to a DICOM printer. The stations configured in the user menu must match the configuration on the DRS Gateway. Please consult with a service professional before changing the user menu settings.

The DICOM Print feature will print RF /SC /SCR images to a DICOM printer on your network. **For best image quality, GEMS recommends SC or SCR image format for DICOM printing.** Specific image configurations (4 on 1, 6 on 1, 12 on 1) and multiple destinations may be configured for a specific network station on the DRS.

DICOM printing is a batch filming process done over the hospital Ethernet network. The DRS console “FILM STUDY” and “FILM IMAGE” buttons are not used.

3–3–4 Modality Performed Procedure Step

The MPPS feature on the DRS Gateway will allow the DRS to notify a worklist provider that a patient procedure has been completed.

3–3–5 Storage Commitment

The storage commitment implementation is only active on the DRS Gateway. The DRS Gateway will receive the patient images from the DRS and will store the data until it receives a storage commit message from the storage device. If the DRS Gateway receives the storage commit from the storage device, it will schedule the information to be deleted. This feature is configurable (on/off) and can only be used if the storage device supports Storage Commitment.

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3–4 PEAK OPACIFICATION (OPTION)

Peak Opacification is a useful way of displaying (the Peak–Opacified Frame, or POF) a whole vessel tree on one frame, despite dilution of the contrast media.

On DRS (Interventional package) it is quick and simple to use:

Press the key, then start Fluoro acquisition (you may also press DURING the fluoroscopy); the Fluoro acquisition is Peak–Opacified. The icon appears on the monitor image and stays displayed for the remainder of the fluoro sequence.

When Fluoro is released, the Peak–Opacification Mode is automatically exited, the last image (the POF) is stored and taken as the Fluoro Mask; Subtraction is activated so that the next Fluoro run will be subtracted using the POF as mask.

If you wish, you can deactivate Subtraction and/or reactivate Peak–Opacification.

You may also run Peak–Opacified Subtracted fluoro.

FNR adjustment is not active during Peak Opacification.

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Example of Peak Opacification applied to a vascular examination:

Catheter insertion is first carried out in normal Fluoroscopy mode. In the final stages of catheter positioning, proceed as follows:

– Press (The icon appears on the monitor image).

– Activate fluoroscopy, and continue to position the catheter.

– Inject the contrast media.

– When Peak Opacification of the artery or vein tree is observed, stop fluoroscopy. The image is then automatically stored and remains displayed on the monitor (F appears on screen).

– Automatic switching is performed on the key, which lights up. (The icon disappears from the monitor image and the icon appears.) Continue catheter positioning using the artery or vein tree stored in memory as a guide.

Local patient immobilization is essential during this procedure.

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3–5 SUBTRACTION (OPTION)

Subtraction is a very useful image processing procedure, used to eliminate fixed structures from the image, keeping only the structures that change (e.g. vessels during injection of contrast media).

Subtraction requires mask definition (usually an image without contrast injection). On DRS, Subtraction depends on system configuration. It allows both real–time (live) and Post–Processing Subtraction to be performed.

Real–time includes Fluoro and Radiography subtraction.

3–5–1 Real–time subtraction (option)

3–5–1–1 Fluoro subtraction (option)

In Fluoro subtraction, any fluoroscopic image can be selected as a mask: just press [MASK] when the image is displayed: the mask number is displayed on the image screen as MS=xx.

Then press and restart Fluoro: the image is displayed subtracted in real time.

It is possible to run Subtracted Fluoro with Peak Opacification (and active). In this case the

and icons are displayed on the monitor image.

When running Peak–Opacified fluoro (subtracted or not), the POF (Peak–Opacified Frame) (see para. 3–4). is automatically selected as the Fluoro mask. If Subtraction was Off, it is automatically activated, so that reactivating Fluoro will in fact start subtracted fluoroscopy.

During Fluoro subtraction, it is still possible to adjust the FNR by pressing and .

It is also possible to store fluoroscopic images on–the–fly during Subtraction. In this case, the stored images are subtracted and cannot be reviewed unsubtracted. Be careful not to select a subtracted image as mask for the next subtracted Fluoroscopy.

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3–5–1–2 Real–time Record Subtraction (option)

In Record subtraction, there are two possibilities:

– If the acquisition rate is Single Shot, any Record image can be selected as a mask: just press when the image is displayed. The mask number is displayed on the image screen as MG=xx. (The icon appears on the monitor image)
Then press (the icon is displayed), single shot and make a Record acquisition; the image is displayed subtracted (only the icon is displayed), but stored unsubtracted, so that subtraction can be rebuilt with another mask if needed.

– During Serial Acquisition (acquisition rate 1 through 6 frame/sec), the mask is automatically the first image of the sequence. Just press and start the Record sequence: Subtraction starts on the second image. As in the case of Single–Shot acquisition, the image is displayed subtracted, but stored unsubtracted, so that subtraction can be rebuilt with another mask if needed.

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3–5–2 Post–processing Record Subtraction (option)

Post–processing subtraction is available for radiographic (record) images, whether subtracted or not.

Press when the Record image that you wish to select as the mask is displayed. (The icon appears on the monitor image). The mask number is updated on the image screen as MG=xx. Desactivate the key to keep the wished mask (the icon disappears from the monitor image).

Then press on any Record image to subtract the image using the mask (the icon appears).

If the and keys are both active (in this case the and icons are displayed on the monitor image), pressing or changes the mask and not the image. If only is active, pressing or changes the image and not the mask.

Mask selection and post–processing subtraction is also possible in Multiview.

Post–processing subtraction is not active on images stored using Fluorostore.

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3–5–3 Mask pixel shift (option)

When Record Subtraction is active, it is sometimes necessary to move the mask with respect to the image, to compensate for motions of the anatomy from one image to another.

This motion may be very small: on DRS, the steps are around 1/10 000 of the image.

When a Record image is displayed subtracted, press one Arrow; the mask will be moved in the corresponding direction. When the shift limit is reached, a beep is emitted.

Press and Arrow simultaneously to reset the original mask position.

To cancel motion artefacts several masks with different pixel shift adjustments can be tried. DRS can store (as long as the same study stays displayed) up to 10 masks with their individual pixel shift position.

Depending on the type of shift, a vector is displayed on the monitor image (Illustration 27):

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Illustration 27 – Pixel shift icon displayed on monitor image

Keyboard action	Display on monitor image

Keyboard action	Display on monitor image
followed by	
followed by	
followed by	
followed by	

“Arrow keys” are available:

– with the control keyboard on the auxiliary DRS console,

– on infrared control keypad.

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3–6 SECOND MONITOR

3–6–1 Manual duplication

A second video monitor may optionally be added in the Procedure Room. This monitor is useful to freeze reference images, while the main monitor displays the live images.

Manual Duplication can be performed before fluoroscopy or radiography as well as after an examination.

The collimation and image number is displayed on the monitor 2.

It is possible to display an image already stored on the hard disk using the following procedure:

– Display the image desired for transfer on monitor 1.

– Press [DUPLICATE] the key lights up and the image is transferred.

– Press [DUPLICATE] again to de–activate the function. The key turns off and the image remains on the second TV monitor until another image is transferred.

3–6–2 Automatic duplication during fluoroscopy

This function allows you to automatically transfer the current fluoroscopic image to an optional second TV monitor. Automatic transfer of images is possible only during subtraction.

– Press [DUPLICATE] , the key lights up.

– Begin the subtracted Fluoro.
The image mask is automatically displayed on the second TV monitor.

– The lighted [DUPLICATE] key turns off once the image mask is transferred to the second TV monitor.

– The image mask remains on the second TV monitor until the next transfer.

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3–6–3 Automatic duplication on second TV monitor

This function allows for automatic transfer of the current image to the second TV monitor. Automatic transfer of images is possible only during subtraction.

– Press once the [DUPLICATE] key (the key lights up).

– Begin fluoroscopic subtraction.
The first image is displayed on the second TV monitor (mask).

– The [DUPLICATE] key turns off once the image is transferred to the second TV monitor.

– The image remains on the second TV monitor until the next transfer.

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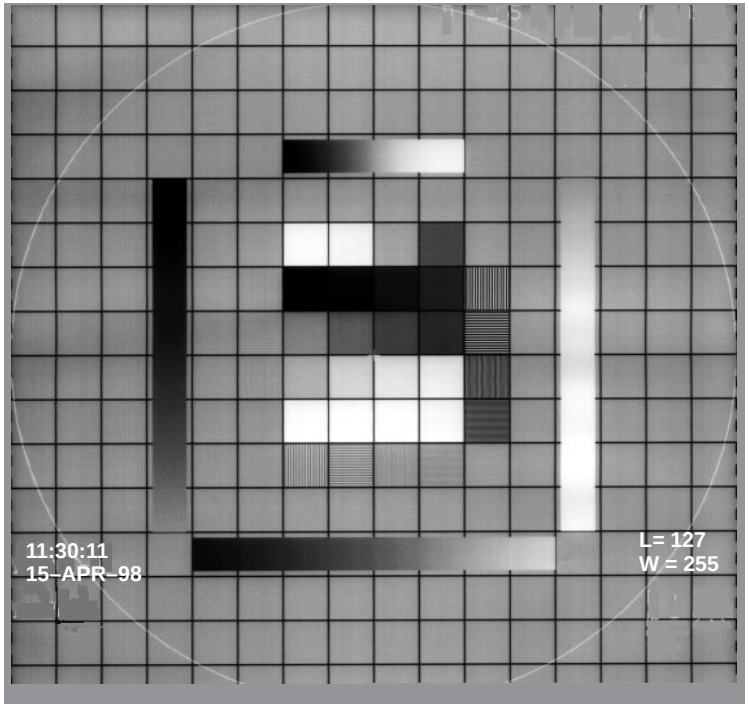
3–7 PATTERN IMAGE

Illustration 28 – Global test pattern



In the user menu, select the DISPLAY PATTERN command and press the key. The pattern is displayed.

This pattern allows TV monitor setting and the film printer optical density adjustment to be checked. An optical densitometer is required.

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Select 4–in–1 format on laser imager console or in the Print menu for examination film.

1. Print the User Menu.
2. Print the global pattern.
3. Print a medical image considered good on the TV monitor. Print the same image in Normal and Reverse Mode, with brightness and contrast levels of 127 and 255, respectively.

Illustration 29 –

USER MENU

LANGUAGE : ENGLISH DATE : DD–MM–YY TIME : HH–MM–SS ON
HOSPITAL NAME
DEFAULT WINDOW (DIRECT) W : *255* L : *127*
(INVERT) W : *255* L : *127* D : 098 BETA : 1.3

			– RAD –	– FLUORO –
WINDOW			REVERSE	NORMAL
EDGE	*ON*	DEFAULT :	*0.4*	*03*
FNR	*ON*	DEFAULT :		*04*

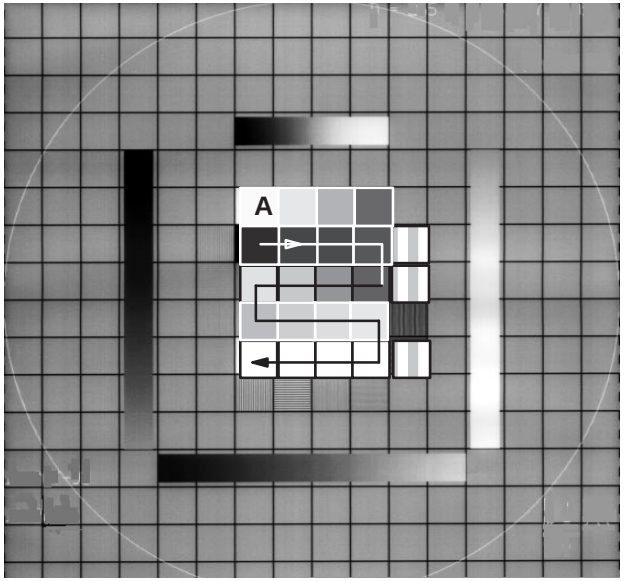
– PRINTER –
IMAGE SELECT *NONE* TYPE : *3M952*
KEYBOARD : *INTERNAL*

– MEASUREMENT –
UNIT : cm DEFAULT SID : 105 SOD : 0100 **(*)**

– SHUTTER – OFFSET : +1

– SUBTRACT –
DEFAULT WINDOW W: 170 L: 085
SUBTRACTED FLUORO: *ON*

CHANGE PARAMETERS	DEFAULT PARAMETERS	DISPLAY PATTERN
FORMAT TAPE	DELETE ALL STUDIES	PING
Answer for Ping :"Alive" or "No Answer" or reset message		PAGE 1/3



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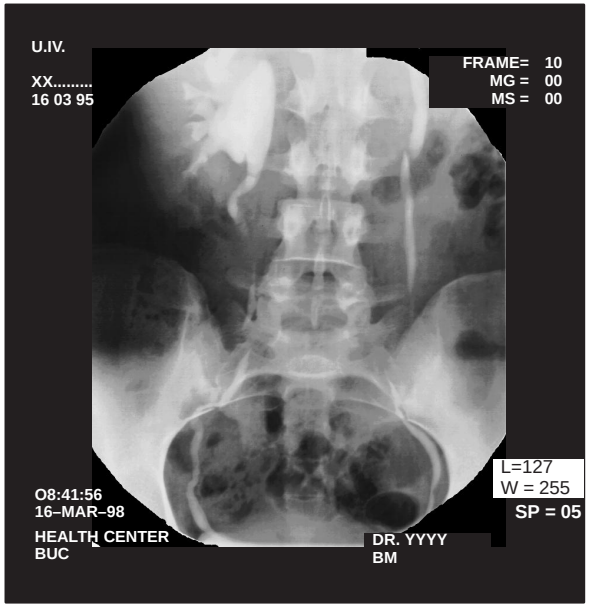

GLOBAL PATTERN: Record the base fog in the white area marked A (see Illustration 29). It should be between 0.18 and 0.20. In the white box, reset the densitometer.

Record the 16 densities from the black area to the white area on the left.

Use the sheet containing the reference curve (Illustration 30), and check the printer density adjustment against the reference curve. The density curve should lie within the upper and lower limits.

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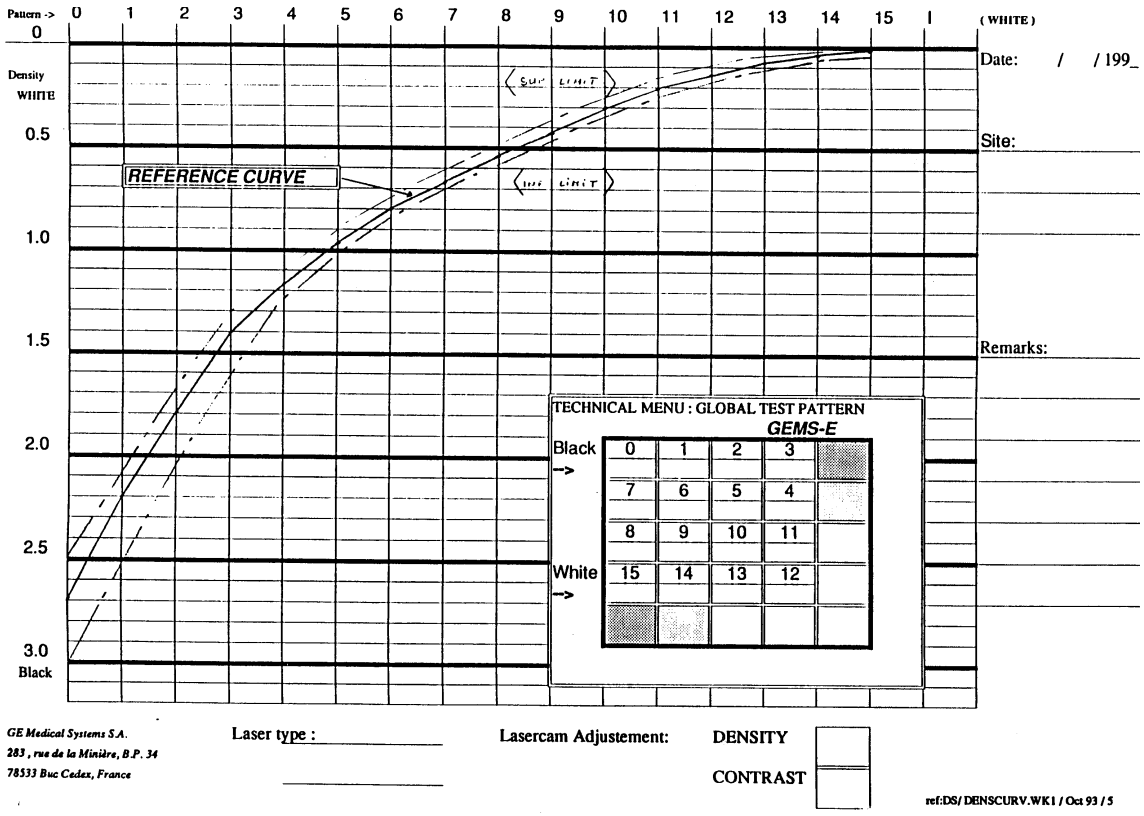
Illustration 30 – Density test adjustment of laser imagers and multiformat cameras



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4 – OPERATING INCIDENTS

4–1 SYSTEM INCIDENTS

Operator warning

DRS is a reliable image processor. However some data processing incidents may occur and prevent performing the study.

Circumstances	Symptoms	Corrective actions
At any moment	A digitized image contains alphanumeric data on the image monitor screen (Illustration 31). If these data disappear, the digital processor has probably gone into analog Bypass mode.	It is recommended that Spot film Device Image Receptor be selected. If necessary, power the DRS off, wait a few seconds, and power it on again. Wait for the end of the Start–Up procedure; if the incident persists, call GEMS Field Engineers.
During X–ray emission	During X–ray emission, if no image appears on the TV monitor, but the yellow X–ray light is on (steady or blinking).	On the generator, switch off the power supply and then restore power. Wait for the end of the Start–Up procedure and, if the incident persists, call GEMS Field Engineers.
In stand–by	If Exposure indicator (Illustration 31), is active (XX displayed or image number increasing) without an operator command.	Switch off the power supply and inform GEMS Field Engineers.

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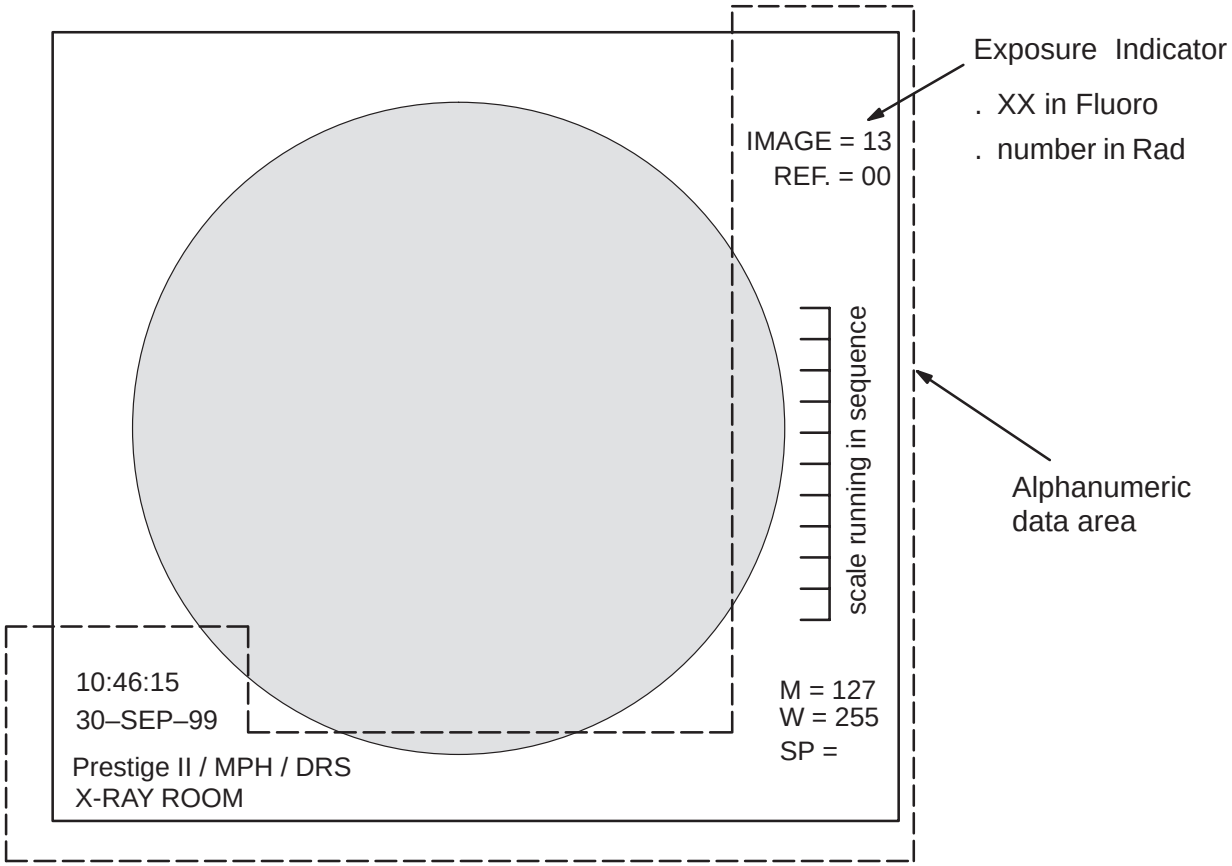
Illustration 31 – Digitized image alphanumeric data area



4

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4–2 INCIDENTS SPECIFIC TO DRS

DRS was designed, and is manufactured, with efficient state–of–the–art tools, to achieve superior reliability.

Means are provided to detect, correct, or bypass component failures.

4–2–1 Incidents during starting up

4–2–1–1 Starting up without incident

Each time DRS is powered up, all its components are self–tested. These tests last less than 90 seconds, and the status of the system at the end is one of the following:

– **DRS OK**: All tests completed with no error.
  During the power–up test, the following message flashes on the main monitor:

  POWER–UP TEST 0.00 00000000

  Simultaneously, a power–up test feedback is provided on the console:

  – All key lamps are lit for a few seconds, then extinguished.
  – The Current Study counter then shows successive codes: E0, 30, 70, etc.
  – The Space Available counter shows four zeros.

  Check periodically that all key lamps and all segments of the displays light up. If not, the keyboard may need to be replaced.

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At the end of the power–up test, the message is replaced by:

SYSTEM CHECK COMPLETE

One beep is emitted on the DRS console and the New Patient menu is displayed. On the console, the Current Study counter shows four dashes whereas Space Available gives the quantity of free image space on disk.

Note : To enable the display of the messages on the main TV monitor, you should preselect the "Digital Record" technique on the Advantx and the last Image Hold Fluoro.

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4–2–1–2 Starting up with major incident

At least one test of a component necessary to perform image recording, failed.

In this case, as soon as the error is detected, the error code is displayed (if possible) on the Current Study counter. The power–up then continues and the error code is transferred to the Space Available menu while Current Study continues to display any subsequent codes.

At the end of the power–up test, four beeps are emitted, the error code remains on the console.

An error is displayed on the Advantx console if you try to select the Digital Record technique, or the Image Hold Fluoro. However, the other Advantx techniques are operational.

Call GE Medical Systems Service to correct the error.

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4–2–1–3 Starting up with minor incident

At least one test of a component failed but image recording and display are still available.

In this case, you are warned in several ways: as soon as it is detected, the error is displayed on the main and optional auxiliary screen:

POWER–UP TEST VO.00 00000000

XXXXXXXX XXXXXXX XXXXXX TEST FAILED

At the same time, the error code is displayed on the Current Study counter of the DRS console. The power–up test then continues and the error code is transferred onto the Space Available menu while Current Study continues to display any subsequent codes.

At the end of the power–up test, two beeps are emitted, the error code remains on the console.

The error is displayed on the Advantx console if you select the ”Digital Record” or last Image Hold in Fluoro. These two techniques stay operational.

The displays on the DRS console show:

– Current Study – – – –

– Space Available 0xxx (where xxx is the space remaining on disk)

The following message is displayed:

POWER–UP TEST V0.00 00000000

POWER–UP TEST FAILED. CALL FIELD SERVICE

PRESS KEYS PATIENT DIRECTORY OR NEW PATIENT TO CONTINUE

Note : This message may not be visible on the main video monitor, depending on the state of the rest of the Advantx system. In this case, check the other symptoms to determine if DRS is failing.

Call GE Medical Systems Service to correct the error.

However, you may still perform some of the DRS functions in a degraded mode. Press PATIENT DIRECTORY or NEW PATIENT keys on DRS.

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4–2–2 Degraded modes of operation

Carefully read the following section if you are using the system in a degraded mode, to determine which functions are available.

If you use the system in degraded mode, the counters on the DRS console show:

– Current Study Hxxx (where xxx can be the Study size, or dashes)

– Space Available 0yyy (where yyy is the space remaining on disk)

The following message is displayed on the New Patient menu:

WARNING! POWER–UP TEST FAILED: DEGRADED MODE

A warning message will be displayed on the New Patient menu and on the console each time it is switched on, or each time the Digital Record technique is selected.

The messages displayed on the TV monitor and on the Advantx console may be different.

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Error message examples:

– Message :

. On Advantx Console: **DISK OR SCSI FAILURE:**

. On DRS Console: **DISK NOT AVAILABLE. STUDY CAPACITY LIMITED TO MEMORY CAPACITY.**

No disk storage or retrieval is possible. The Patient Directory cannot be displayed, and studies already stored on disk cannot be retrieved. Such errors may imply disk replacement or reformatting. In this case, the studies will be lost. In some cases, GE Medical Systems Service will be able to recover such errors by repairing corrupted disk files.

With no operational disk, it is still possible to create studies and perform all types of Fluoro and Record acquisitions and all post–processing functions, except Film Study (Film Image is still possible), Networking, and Archiving.

However, the capacity is limited to 26 images (optional 57). When this limit is reached, further acquisitions are impossible in the Digital Record technique, unless images are deleted. Note that the images are destroyed when the system power supply is shut down.

To create a new study, you must delete the current study by pressing .

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– Message :
  . On Advantx Console: **DRS RAM IMA1 OR BOTH IMA2 FAILURE:**
  . On DRS Console: **MEMORY NOT AVAILABLE. ONLY NON SUBTRACTED FLUORO AVAILABLE**

  No disk storage or retrieval is possible. The Patient Directory cannot be displayed, and studies already stored on disk cannot be retrieved, but the studies are still present on disk, and can be retrieved when the failure is repaired.

  No RAM storage is possible.

  It is still possible to create studies and perform Image Hold Fluoro acquisition. Record acquisitions and post–processing are not available.

– Message :
  . On Advantx Console: **DRS RAM IMA2 FAILURE:**
  . On DRS Console: **MEMORY EXTENSION NOT AVAILABLE. REDUCED MEMORY CAPACITY**

  All acquisitions and post–processing are still possible,but the RAM capacity will be limited to 26 images instead of 57.

– Message :
  . On Advantx Console: **DRS TRAIT FAILURE:**
  . On DRS Console: **FILTERINGS AND SUBTRACTION NOT AVAILABLE**

  All acquisitions are still possible, except Peak–Opacification and Subtractions. Fluoroscopy will have no FNR.

  Post–processing functions are still available, except edge–enhancement filtering, Zoom, and Subtraction.

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– Message :
  . On Advantx Console: **DRS GEL2 FAILURE:**
  . On DRS Console: **SUBTRACTION NOT AVAILABLE**

  All acquisitions and post–processing are still available, except Subtractions and Duplicate.
– Message :
  . On Advantx Console: **DRS GEL3 OR SERIAL LINE FAILURE:**
  . On DRS Console: **IMAGE TRANSFER TO PRINTER NOT POSSIBLE**

  All acquisitions and post–processing are still available, except Film Image or Film Study.
– Message :
  . On Advantx Console: **DONGLE ETHERNET NOT PRESENT:**
  . On DRS Console: **NETWORK OPTION NOT AVAILABLE**

All acquisitions and post–processing remain possible, except image transfer to a review workstation.

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4–2–3 Incidents during acquisition or study review

Some errors may occur during acquisition or study review. The following error messages are displayed on Advantx Console, or on TV monitor:

– **MAX NUMBER OF STUDIES DEFINED**

  DRS is limited to 100 studies. Delete studies to continue.

– **MAX NUMBER OF IMAGES IN A STUDY**

  DRS is limited to 200 images per study. Delete images or create a New Patient to continue.

– **DIG REC MODULE OUT OF DISK SPACE**

  DRS is limited to 2000 or 4000 images depending on disk type (optional capacity increase to 800 or 1800 for previous DRS model upgraded to DRS3.2). Delete images or studies to continue.

– **MHR TEMPERATURE TOO HIGH**

  High temperatures can severely damage the electronic components of DRS, especially the disks, and/or corrupt images. DRS has temperature sensors that detect abnormal temperatures in the DRS cabinet. These temperatures can either be due to an excessive room temperature, fan failure, or dust in filters.

  In the event of excessively high temperatures, DRS first displays the following message:

TEMPERATURE WARNING

All acquisitions and post–processing are still available at this time. However, should this message appear, complete all current tasks, store the current study on disk, and remove power from the whole room.

If this is not done, and the temperature continues to rise, DRS then displays the following message:

TEMPERATURE ALARM

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Then an error message is displayed on the Advantx console. DRS recording and last image hold fluoroscopy are no longer available. Remove power from the whole room.

– **OPERATOR ANSWERED NO TO APPEND IMAGE QUESTION**

  It is necessary to select New Acquisition in the Study Retrieval screen if you wish to perform subsequent acquisitions.

– **NO CURRENT STUDY ON DRS**

  It is not possible to perform acquisitions in Digital Record technique, or to run Image Hold Fluoro outside of a study. Create or retrieve a study to acquire images.

4–2–4 Incidents during network transfer

– **NETWORK NOT OPERATIONAL**

Some device on the network or the whole network is not operational. See DRS Gateway LCD Display for further details.

4–3 INSITE® (REMOTE CONTROL SERVICE DIAGNOSTIC)

According system configuration.

GEMS after sale service is able to make a remote diagnostic and for Advantx systems to remotly download images from DRS disk for analysis purpose, via Insite remote service function.

Contact GE Medical Systems Service for more details on InSite®. (Option for some configurations).

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4–4 PATIENT CONFIDENTIALITY

For some maintenance operations related to image quality, it may be necessary for the service people to get some images back to manufacturer for analysis. The images may be get back through tapes using Exabyte or via Insite connection (on Advantx rooms)..

As the images may contain the patient identification (name, social security number) in the annotations, some countries have laws related to the medical secret that require respect of the patient confidentiality by the healthcare professional.

To meet the obligations of these laws, it exists in the DRS the possibility to delete the patient identification annotations before archiving them for non medical purpose (image quality investigation).

1. If the images are still on hard disk: delete the patient identification by applying following procedure:
   - enter in Retrieval menu (Illustration 21, page 79),
   - click on “Patient ID” field,
   - erase manually the patient identification,
   - validate by pressing “Enter” key of the alphanumeric keyboard.

   Then archive the study.
2. If the images were already archived on Exabyte, first restore the images on the hard disk and follow previous procedure.

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5 – PREVENTIVE MAINTENANCE

Table 1 – Maintenance schedule

EQUIPMENT: DRS – CONSOLE DRS PROBLEMS: SERIAL No.: from to	PREVENTIVE MAINTENANCE SCHEDULE PAGE 01/02		
DESCRIPTION	INTERVAL	USER	GEMS
Scheduled operation: – Clean keyboards. Check correct operation of cooling fans.	Every 12 months		x
PM1A Acceptance test (covering DRS and Console).	Every 12 months		x

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EQUIPMENT: DRS – CONSOLE DRS PROBLEMS: SERIAL No.: from to	PREVENTIVE MAINTENANCE SCHEDULE PAGE 02/02		
DESCRIPTION	INTERVAL	USER	GEMS
DRS CONSOLE Scheduled operations: – Clean keyboard and function keys. with a non abrasive product.	Every 12 months	x	
RECORDERS Clean the head of the recorders by using the cleaning cartridge when the following message appears: WARNING: CLEAN THE TAPE DRIVE UNIT or when top and bottom led of Exabyte are both flashing (see page 95). Use exclusively the cleaning cartridge recommended for Eliant 820.	According to usage	x	
DRS GATEWAY Clean dust from front vents of PC Tower.	Every 6 months.	x	

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6 – FEATURES

6–1 PERFORMANCE DATA

6–1–1 Image acquisition

– 1249 [1023] line non–interlaced video input, 8–bit/40–MHz sampling, providing high resolution images.
– Radiography mode: single–shot, or up to 6 frames/sec user–selected acquisition rate.
– Real–time Edge–enhancement filter applied to all images.
– Fluoroscopy mode: 25 [30] frames/sec acquisition rate.
– Programmable and adjustable (option) fluoro noise reduction (FNR) with motion detection.
– Optional Peak–Opacified fluoroscopy and subtraction.
– Programmable real–time edge–enhancement filter.
– User–controlled on–the–fly storage of fluoroscopic images. Storable Last Image Hold.

6–1–2 Image display

– 1249 [1023] line interlaced video output, 256 gray levels with programmable and user–selectable gray scale inversion and image–linked gray scale settings (Window/level).
– Superimposition of a circular black mask.
– User–activated automatic digital shutters to mask collimator blades (optional).
– Horizontal and/or vertical digital image reversals with Right/Left tag fields and Reverse icon.
– User–entered study description (20 characters) and Image–linked annotations (five lines), with user–defined dictionary for quick annotation.

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– 4–in–1 collage for display of four successive images of a study, with the image–linked shutters if selected.
– 15–in–1 collage for display of 15 successive images of a study with the image–linked shutters if selected, and the demographic data of the study.
– Dedicated key, to duplicate and freeze any still image on 2nd monitor (optional).

6–1–3 Image post–processing

– 2 x 2 interpolated zoom of a Region Of Interest, and 32–pixel roaming.
– Horizontal and vertical digital shutters can be moved, with 8–pixel resolution on each side.
– Range of 20 large–kernel post–processing Edge–enhancement filters, plus one equalization filter (according to configuration).
– Dynamic radiography sequence review, at the rate of acquisition.
– Length and angle measurements with user calibration (optional).
– Pixel–shift on subtracted images (option).
– User–selectable copy of filters, window/level and annotations to next images (option).

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6–1–4 Patient file management

– One (standard) or two (option) hard disks for patient files storage, store up to 100 studies, of up to 200 images each, with a maximum of 2000 or 4000 images on both disks, (800 to 1800 for previous DRS models upgraded to DRS3.2).

– Automatic, study–linked, date and time.

– Patient data include Patient Name, Patient Id, Study Description, Radiologist Name, and Referring Department.

– Patient directory displays Patient Name, Date of Study, Patient Id, and Referring Department. New images can be appended to an existing study.

– Images can be deleted inside the retrieved study, and a Study can be deleted from the Patient Directory if unprotected.

6–1–5 Image Filming/DICOM Printing

– Digital data link, and embedded control of GE laser film printer and other laser film printers, including 3M P831, 3M M952 (with or without MMU), 3M M969, Kodak 100XLP, Kodak 2180, DuPont Lynx400, and Agfa MG 3000.

– Film Study: Automatic background transfer to the film printer of user–selected images.

– Network transfer of images to DICOM 3 compatible devices (DICOM 3 print to network printers).

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6–1–6 Subtraction (option)

– Fluoroscopy: Real–time subtraction.
On–the–fly storage of subtracted image still possible.
– Radiography: Real–time subtraction (option) of first image of the sequence to live image.
Storage of unsubtracted live image.
– Post–processing: User–selected mask subtracted to any Record image.

6–1–7 Network and Archiving (options)

– Digital data archiving on 8–mm magnetic cartridge (option).
– DICOM3 compatibility, allows to send user–selected images to Advantage Windows or other diagnosis workstations, on Ethernet network (option).

6–1–8 Utilities

– The optional second console duplicates the post–processing controls and allows diagnosis outside the procedure room.
– Degraded mode capabilities in the event of failures, and bad–block–based image RAM to tolerate errors and increase uptime.
– InSite® remote access (option).
– User menu allows entry and modification of hospital name, date, time, laser camera parameters, filter strengths, reverse curve shapes, and address of workstations.
– Several utilities help adjusting and calibrating the video image chain, both on incoming and outgoing video, for superior image quality.
– User–activated study protection prevents accidental deletion of studies from the disk.

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6–2 PHYSICAL ENVIRONMENT FOR ADVANTX DRS

6–2–1 Cabinet For Advantx DRS

– Size:	43 in high x 18 in deep x 33 in wide (1092 x 457 x 965 mm)
– Weight:	102 kg (225 lb) including complete MHR rack 135 kg (298 lb) including console, wall box, and external cables (excluding transformer)
– Holes for mounting:	cabinet anchored to the wall (two holes) and to the ground (four holes)
– Steel thickness:	3 mm
– Main power:	230 V (ac) single–phase (187 to 264 V), 47 to 63 Hz, 1.5 kVA
– Power dissipation:	1.2 kW
– Current inrush (power–up):	< 160 A for 4 ms
– Ambient temperature:	+15 to +35°C (operation), max gradient 20°C/h –10 to +55°C (storage), max gradient 20°C/h
– Relative humidity:	30% to 80% non–condensing, max gradient 10%/h
– Altitude:	–300 to +3000 meters (–1000 to +10000 ft) (operation) –300 to +12000 meters (–1000 to +40000 ft) (transit)
– Static discharge tolerance:	8 kV (in air)
– Audio noise:	46 dBA at 1 m
– Air flow rate:	140 l/s (5 cu. ft/s) (approx.)

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6–2–2 Console For Advantx DRS (1st and 2nd DRS auxiliary console)

- Size: 18 in wide x 4 in high x 12 in deep (457 x 102 x 304 mm)
- Weight: 6 kg (13.25 lb)
- Power dissipation: 20 W
- Ambient temperature: +15 to +35°C (operation)
–40 to +70°C (storage)
- Relative humidity: 40% to 80% non–condensing (operation)
8% to 90% (storage)
- Static discharge tolerance: 8 kV (in air)
- Audio Noise: N/A
- Air flow rate: N/A

An optional second console can be purchased, and placed in the remote location (up to 30 meters) for image review and diagnosis. This console is identical to the main DRS console.

6–2–3 Wall box (option)

- Main power: 110 to 230 V ac single–phase, 47 to 63 Hz, 100 VA
- Power dissipation: 70 W
- Ambient temperature: +15 to +35°C (operation)
–40 to +70°C (storage)
- Relative humidity : 30% to 80% non–condensing
- Static discharge tolerance: 8 kV (in air)
- Noise: N/A

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REVISION HISTORY

REV	DATE	REASON FOR CHANGE	PAGES
0	April 2000	Initial release	
1	September 2000	Clarified Image and Study Deletion time between key presses.	142
2	September 18, 2000	Added DRS Gateway.	144
3	May 23, 2001	Added DRS TV Monitor Screen Saver.	144

IMPORTANT WHEN UPDATING	Documents 2236980–100 2236981–100,et 2236982–100 are linked. They have a common master file 2236983–100 (not orderable) to be used for updating. Please consult the Read me before updating.

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